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ROYAL BOTANIC GARDENS, KEW

XXV—THE GENUS NEUROCALYX IN BORNEO.

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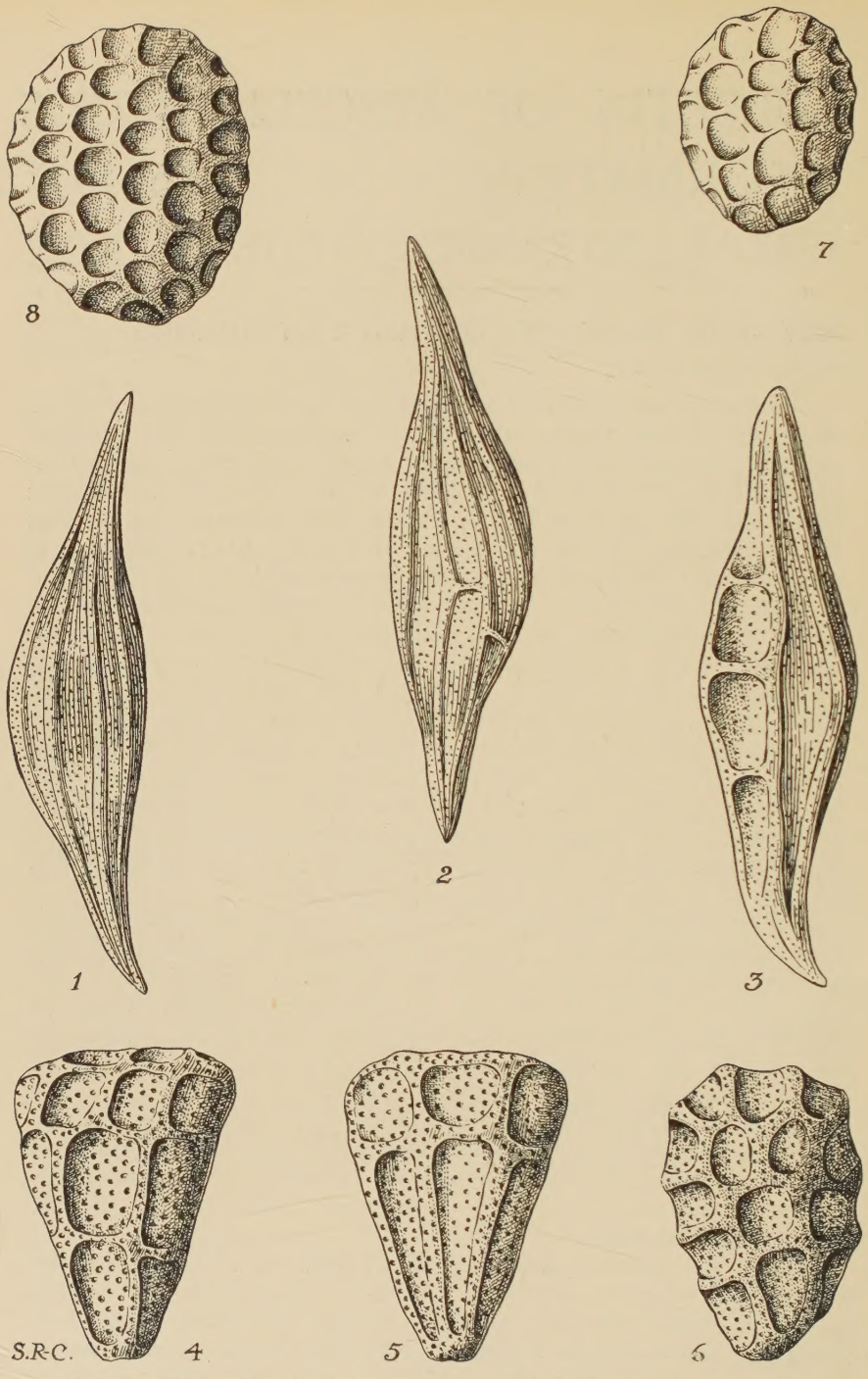
Bornean specimens of *Neurocalyx* had been collected as early as the middle of the nineteenth century (e.g. by Lobb and Beccari), and were referred to in subsequent floras and general works (e.g. Hook. fil. Fl. Brit. Ind. **3**, 47 : 1880 ; Baillon, Hist. Pl. **7**, 330, 466 : 1880 ; K. Schum. in Engl. et Prantl, Nat. Pflanzenf. **4**, 4. 32 : 1891 ; Boerlage, Handl. Fl. Nederl. Ind. **2** (1), 124 : 1896), but it was not until 1913 that any species were described. In December of that year descriptions of three species (*corollinus*, *borneënsis* and *elatus*) were published by Th. Valeton (in Fedde, Rep. **12**, 513). Two years later a supposed fourth species, *N. matangensis*, was described by W. W. Smith (in Notes Roy. Bot. Gard. Edinb. **8**, 323 : 1915). Further investigation, however, of the specimens referred to this species has shown that it consists of a mixture of forms of *N. borneënsis* and *N. corollinus* (see further under *N. borneënsis*, p. 288). Recently two new species have come to light exhibiting sepals modified into conspicuous organs of attraction in the manner of *Mussaenda* and *Warscewiczia*. The latter genera are not, of course, closely related to *Neurocalyx*.

The genus falls into two well-marked sections, both morphologically and geographically. The group containing the species originally described is distinguished by a racemose inflorescence and equal calyx segments, and is localised in Ceylon and southern India. In the other group the inflorescence is thyrsoid and the calyx-segments are usually very unequal ; the species are confined to Borneo. These two groups may be defined as follows :—

Series i. **Thyrsoïdeae** *Airy-Shaw*, ser. nov. Inflorescentiae thyrsoïdeae ; sepala saepe valde inaequalia ; semina fusiformia vel angulato-cuneiformia, testa costata vel reticulata et insuper minutissime foveolata.—Spp. 5–6, Borneënses (*vide infra*). Typus, *N. borneënsis* Valeton.

Series ii. **Racemosae** *Airy-Shaw*, ser. nov. Inflorescentiae racemosae ; sepala aequalia ; semina sphaeroïdea vel saltem rotundata, testa reticulata sed haud insuper foveolata.—Spp. 4–5, Zeylaniae peninsulaeque Indiae meridionalis incolae (*vide* Trimen, Handb. Fl. Ceyl. **2**, 299 : 1894 ; Alston, Suppl. 141 : 1931 ; Gamble, Fl. Pres. Madr. 591 : 1921). Typus, *N. zeylanicus* Hook. fil. (*Cf.* Tab. 1, figs. 7, 8.)



Tab. 1. Representative types of seeds of *Neurocalyx*. 1, 2, *N. pterosepalus* Airy-Shaw (*Richards* 1622). 3, *N. elatus* Valeton (type). 4, 5, *N. borneënsis* Valeton var. *oligotrichus* Airy-Shaw (type). 6, *N. corollinus* Valeton (*Haviland* 682). 7, *N. zeylanicus* Hook. (*Walker*, type). 8, *N. calycinus* (R. Br.) B. L. Rob. (*N. Wightii* Arn.; Shivagerry, *Wight*, type of *N. Wightii*). All × 80.

The seeds afford good characters for distinguishing groups of species. Those of Series *Racemosae* are rather uniform, subspherical, with a rounded type of reticulation and no minute pitting in addition (Tab. 1, figs. 7, 8). In Series *Thyrsoïdeae* two main types are found : the subcuneiform and reticulate, and the fusiform and costate. Of the two species belonging to the former type, *N. corollinus* (Tab. 1, fig. 6) has seeds most closely resembling those of the *Racemosae*, but the reticulation is considerably coarser and less rounded, and the presence of the additional minute pitting, common to all the *Thyrsoïdeae*, as well as the subcuneiform general shape, at once distinguishes it. The truncate-cuneate seeds of *N. borneënsis* (Tab. 1, figs. 4, 5), with their squarish or elongate reticulation, are very characteristic. The fusiform type of seed characterizes *N. pterosepalus* (Tab. 1, figs. 1, 2), *N. pleurocarpus* (not figured) and *N. elatus* (Tab. 1, fig. 3), the differences between them being small. The seeds of *N. pleurocarpus* may be distinguished from those of *N. pterosepalus* by the occasional cross-connections between the ridges being oblique rather than transverse.

Key to Series Thyrsoïdeae.

Unum sepalum floris centralis cuiusque cymulae in appendicem magnum unguiculato-spatulatum rigide membranaceum auctum ; stylus pilosus ; semina fusiformia ; frutices usque 3 m. alti :

Robusta ; caulis usque 1 cm. diametro ; folia bullata, nervis primariis utrinque 13–19 ; sepala normalia lanceolata ; capsulae oblongae, ecostatae ... 1. *pterosepalus*

Gracilior ; caulis usque 3 mm. diametro ; folia plana, nervis primariis utrinque 10–13 ; sepala normalia parva, triangulari-subulata ; capsulae breviter ovoïdeae, conspicue costatae ... ... 2. *pleurocarpus*

Sepala haud uti supra aucta ; herbae pusillae usque suffrutices 1 m. alti :

Stylus pilosus ; semina fusiformia ... ... 3. *elatus*

Stylus glaber ; semina truncato-cuneiformia vel ovoïdea, testa foveolato-reticulata :

Folia basi angustata ; sepala inaequalia ; semina truncato-cuneiformia ... ... 4. *borneënsis*

Folia basi rotundata ; sepala angusta, aequalia ; semina subcuneiformi-ovoïdea ... ... 5. *corollinus*

1. **Neurocalyx pterosepalus** *Airy-Shaw* ex Richards in Journ. Ecol. **24,** 352 (1936), *nomen* ; sp. nov. insignis, in genere facile maxima, a *N. pleurocarpo* Airy-Shaw (*vide infra*) habitu robustiore, foliis bullatis, nervis crebrioribus, sepalis normalibus maioribus lanceolatis, capsulis oblongis ecostatis distincta. (Tab. 2).

Frutex 2–3 m. altus. *Caulis* simplex, circiter 1 cm. crassus, inferne nudus, plus minus angulatus, nodis et cicatricibus foliorum

delapsorum crebre notatus, cortice fusco dense pubescente, internodiis plerumque 1–2 cm. longis. *Folia* oblanceolata, rarius fere oblongo-oblanceolata, 15–25 cm. longa, 5–7·5 cm. lata, basi sensim cuneato-attenuata, apice plus minus rotundata (rarius subacuta) et brevissime late cuspidata, margine integro revoluto, supra parce longiuscule fulvido-pilosa, demum glabrata, subtus praesertim costa nervisque adpresse sericeo-fulvido-pilosa et simul pilis minimis curvulis undique conspersa, siccitate flaccidulo-herbacea, brunnescentia, supra obscura, infra plus minus nitentia, per lucem transmissum visa mesophylla aureo-brunneo-translucente, venulis ultimis reticulum densissimum efformantibus ; costa et nervi primarii supra bullato-impressi, infra valde prominentes, nervi primarii a costa angulo circiter 45° orti, stricte paralleli, 5–10 mm. inter se distantes, inferiores fere usque ad marginem recti, superiores inde a medio sursum arcuati, omnes prope marginem anastomosantes ; nervi secundarii angulo subrecto inter primarios laxe scalariformiter dispositi, multo graciliores ; petioli 2–4 cm. longi, 2–3 mm. lati, striati, parce adpresso-pubescentes. *Stipulae* maximae, ochreiformes, supra petiolos annulatim connexae, plus minus ovatae, usque 3 cm. longae, apice alte et acute laciniatae, laciniis subulatis, submembranaceo-herbaceae, parallelo-nervosae, brunneae, extra undique brevissime crispulo-puberulae, basin versus longe adpresso-sericeae, intus omnino sericeae, sericeo-ciliatae. *Inflorescentiae* (tempore florendi nondum cognitae) axillares, regulariter thyrsoïdeae, foliis subaequilongae, longissime pedunculatae, iuniores cernuae, maturae patulae ; pedunculi 10–17 cm. longi, 1–2 mm. diametro, teretes, subtiliter striati, subrecti, dense crispulo-puberuli et sparsius adpresse strigosi ; ramuli patuli vel patentes vel interdum leviter reflexi, breves, usque 2 cm. longi, iterum ternatim ramosi, inferioribus flores 7, superioribus flores 3 plerumque gerentibus, indumento flavido duplici ut pedunculus omnino induti ; bracteae bracteolaeque lanceolatae (rarius sub ramulos infimos late ovatae), acutae, 5–8 mm. longae, submembranaceae, nonnunquam basi laciniis paucis subulatis vel setaceis glanduliferis utrinque auctae, basi ramulos plus minus amplectentes ; pedicelli 5–15 mm. longi, graciles. *Hypanthium* obovoïdeo-oblongum, circiter 2 mm. longum, pubescens. *Sepala* normalia lanceolata, 2 mm. longa, strigosa, basi glandulis paucis anguste cylindricis stipitatis utrinque instructa. *Petala* contorta, lanceolato-oblonga, circiter 8 mm. longa, glabra. *Antherae* subsessiles, lanceolatae, in conum circiter 6 mm. longum cohaerentes. *Stylus* gracilis, circiter 7 mm. longus, patenter pilosus, stigmate capitato. *Capsulae* oblongo-obovoïdeae, 4–6 mm. longae, 3–4 mm. latae, subdidymae, subtiliter nervoso-striatae, pubescentes, in mericarpia duo demum solutae, calycis segmentis persistentibus erectis, floris terminalis cuiusque cymuli uno sepalo (raro duobus) valde aucto membranaceo, more *Warscewicziae* vel *Mussaendae*, longe unguiculato-spatulato, ungue plano 5–10 mm. longo 1 mm. lato 7-nervio pubescente,

Tab. 2. *Neurocalyx pterosepalus* Airy-Shaw. 1, part of stem, showing stipules, *nat. size*; 2, leaf, *nat. size*; 3, inflorescence, *nat. size*; 4, flower, × 3; 5, androecium, from without, × 6; 6, two stamens, from within, × 6; 7, flower in longitudinal section, corolla and stamens removed, × 6; 8, capsule dehiscing, also showing base of enlarged sepal, × 3; 9, transverse section of carpel, × 3; 10, a seed, × 20.

limbo oblongo vel lanceolato-oblongo 2–3 cm. longo 1–1·4 cm. lato apice rotundato saepe apiculato longitudinaliter 5–7-nervio pulchre reticulato-venoso supra obscuro subtus nitente nervis subtus sparse puberulis ceterum glabro pallide roseo. *Semina* numerosa, minuta, vix 1 mm. longa, late fusiformia vel cymbiformia, utrinque attenuata, testa castanea longitudinaliter costata, costis longitudinalibus trabeculis paucis transversis interdum coniunctis.

Sarawak. Dulit ridge, moss-forest, *c.* 1230 m., 1 Aug. 1932, *Richards* 1057 (typus, Herb. Kew.): "Thin shrub, *c.* 3 m. high. Leaves crowded in a tuft at the apex of the stem." Ibid., 8 Sept. 1932, *Richards* 1622: "Shrub, 2–3 m. high. Lower part of stem leafless. ? Bract pale pink. Inflorescence pink."

The present species is placed first as probably representing the nearest approach in habit to the generic prototype. The *Schauapparat* provided by the enlarged sepal of certain flowers of the inflorescence, and the drawn-out testa of the seeds, are on the other hand no doubt characters of a derivative nature. An interesting comparison may be drawn between the types of seeds in *Neurocalyx* and those in *Rhododendron*, referred to by Ridley in his "Dispersal of Plants," 127, t. III (1930) and in greater detail by Kingdon Ward in Journ. Bot. **73,** 241 (1935). Unfortunately, enough is not yet known of the habitats of *Neurocalyx* species to render a detailed comparison possible. *N. pterosepalus* is a lanky shrub of the moss-forest on Mt. Dulit, but it seems unlikely that the closely allied *N. pleurocarpus* (see below) would occur in a similar formation as low down as 150 m. on Mt. Lambia, though there may well be a development of moss-forest on the 1000 m. high Batu Ajoh (see *N. elatus*, below). Ridley emphasizes the fact that this type of seed ("dust-seed") is primarily an adaptation for wind-dispersal, which may account for the apparent correlation of "dust-seed" with tall habit in *Neurocalyx*. The rounded or angular, unwinged seeds of the low-growing species are presumably dispersed by rain-wash.

2. **Neurocalyx pleurocarpus** *Airy-Shaw*, sp. nov., *N. pterosepalo* Airy-Shaw affinis, sed omnibus partibus minor graciliorque, foliis tenuioribus haud bullatis, nervis distantioribus, sepalis parvis triangulari-subulatis, capsulis breviter et late ovoïdeis conspicue costatis.

Suffrutex parvus vel *herba* elata, statura ignota. *Caulis* (apice tantum cognito) ut videtur simplex, 2–3 mm. diametro, adpresse strigoso-pubescens, internodiis 1–2·5 cm. longis. *Folia* oblonga usque oblongo-oblanceolata, 13–21 cm. longa, 3–5 cm. lata, basi sensim angustata, apice breviter caudato-acuminata, margine integro plano, supra brevissime et parcissime pilosa, costa adpresse strigoso-pubescente, subtus parce crispule pubescentia, costa nervisque pilis longis et brevibus densiuscule adpresse strigosis, membranacea, siccitate vix brunnescentia, sed sub lente pagina superiore punctis minutis brunneis dense conspersa, utrinque

obscura (i.e. haud nitentia), haud conspicue translucentia ; costa nervique supra plani, subtus prominuli ; nervi primarii graciles, 10–13-jugi, angulo circiter 45° a costa orti, 1·2–1·7 cm. inter se distantes, prope marginem anastomosantes ; nervi secundarii et ultimi tenuissime reticulati ; petioli 3–5 cm. longi, adpresse strigosi. *Stipulae* late ovatae, circiter 1 cm. longae, 7–8 mm. latae, acuminatae, laciniatae, membranaceae, conspicue nervosae, medio dorso longe strigosae, intus dense strigosae, margine longe ciliatae, ceterum glabrae. *Inflorescentiae* axillares, regulariter thyrsoïdeae, foliis subaequilongae, longe pedunculatae, patulae ; pedunculi 6–11 cm. longi, modice graciles, teretes, subtiliter striati, subrecti, basi saepe abrupte deflexi, densiuscule adpresso-pubescentes ; ramuli patuli, graciles, 1–2 cm. longi, sparsius adpresso-pubescentes, ut in *N. pterosepalo* iterum ramosi ; bracteae bracteolaeque lineares vel angustissime lanceolato-ellipticae, acutae, 3–10 mm. longae, 0·5–2 mm. latae, submembranaceae, nervosae, basi " stipulis " parvis subulato-setaceis glandulo-apiculatis instructae ; pedicelli graciles, 8–18 mm. longi. *Hypanthium* compresse obovoïdeum usque subglobosum, 1 mm. diametro, angulatum. *Sepala* normalia triangulari-subulata, 1–1·5 mm. longa, acuta, margine basin versus glandulis elongatis praedita ; sepala dilatata (sub tempore florendi) anguste oblongo-oblanceolata, 10–12 mm. longa, 1·5 mm. lata, utrinque angustata, acuta, membranacea, trinervia, glabra. *Petala* basi brevissime connata, lanceolata, 6–7 mm. longa, circiter 1·5 mm. lata, sensim acuminata, acuta, basi abruptiuscule angustata, 5–nervia, aestivatione contorta. *Antherae* anguste lanceolatae, subsessiles, in conum angustum acutum circiter 5 mm. longum cohaerentes. *Stylus* filiformis, antheras paullo superans, patenter pilosus, stigmate parvo capitato. *Capsula* breviter et late compresso-ovoïdea, 3 mm. longa, 3–4 mm. lata, conspicue 10-costata, parce pubescentia, sepalis persistentibus coronata, sepalo dilatato fere ut in *N. pterosepalo*, sed ungue 10–12 mm. longo, lamina 3–5-nervi acuta mucronata. *Semina* numerosa, fusiformia, 1 mm. longa, testa castanea longitudinaliter costata (costis trabeculis obliquis raro connexis) utrinque in caudam tenuem producta.

SARAWAK. Mt. Lambia, 150 m., May 1895, *Haviland & Hose* (B.M. distrib. no.) 2005 (Herb. Mus. Brit.).

I am indebted to Messrs. A. H. G. Alston and C. Norman for calling my attention to this interesting plant, which was included in a small collection recently found by them in the store of the Department of Botany, British Museum. I have to thank the Keeper for the loan of material for investigation. This collection is not represented in the Herbarium of the Royal Botanic Gardens, Kew. It is apparently the last collection which Haviland and Hose made, and from an area not previously visited by them, nor, so far as I am aware, by any subsequent collectors.

The material of *N. pleurocarpus*, though ample, unfortunately consists only of the uppermost part of each stem, so that it is not

possible to estimate the height of this plant. It is closely allied to *N. pterosepalus*, but is smaller in all its parts, and the shortly ovoid, not oblong, capsule is conspicuously ribbed.

Mt. Lambia or Lambir is a peak rising to a height of 465 m. near the centre of a sandstone ridge running parallel to and about 5 miles from the coast, about 25 miles south of the mouth of the Baram River in northern Sarawak (*cf.* map of the Baram district, illustrating Hose's paper on his journey to Mount Dulit, in Geogr. Journ. **1,** 193 : 1893). It is about 70 miles north of Mt. Dulit, likewise of sandstone formation. It is a remarkable fact that so far no representative of the genus *Neurocalyx* is known from the sandstone spurs around Kinabalu, despite the collecting work of Low, Haviland, Gibbs and the Clemens. Mt. Lambir is therefore the most northerly known locality for the genus.

3. **Neurocalyx elatus** *Valeton* in Fedde, Rep. Spec. Nov. **12,** 514 (1913) ; Merrill, Bibl. Enum. Born. Pl., in Journ. Str. Br. Roy. As. Soc., special no., 550, 592 (1921).

Dutch Borneo: South and East Division. Bukit Batu Ajoh, 1896–7, *Jaheri* in Exped. *Nieuwenhuis* 1655 (Herb. Hort. Bog.).

The peak of Batu Ajoh (Ajo, Ajow) is situated in approximately lat. 0° 45′ N. and long. 5° 45′ E., on the right (south) bank of the upper Mahakam River. According to Nieuwenhuis, in Peterm. Geogr. Mitteil. **44,** 12 (1898), it rises to a height of 1000 m. and is composed of sandstone. This is the most easterly locality for *Neurocalyx* in Borneo and so far the only record for the genus in the S. & E. Division.

As in the case of *N. pleurocarpus*, the precise stature of the plant remains unknown, since only the upper part of the stems was collected. *N. elatus* forms a transition from the *pterosepalus* type to the *borneënsis* type, agreeing with the former in the fusiform seeds and hairy style and with the latter in the absence of the enlarged sepal.

It is not clear why Valeton, in his original description, stated " Capsula ignota." On the two sheets in Herb. Bogor. (*cf.* Plate IX), which were kindly sent on loan to Kew by the Director, Dr. D. F. van Slooten, there are numerous capsules present, some containing ripe seed. A description of these is now supplied.

Capsula oblonga, 4–5 mm. longa, 2·5–4 mm. lata, strigoso-pilosa, sepalis persistentibus erectis. *Semina* fusiformia, vix 1 mm. longa, testa utrinque breviter caudato-attenuata longitudinaliter costata et parce reticulata pallida.

4. **Neurocalyx borneënsis** *Valeton,* l.c. ; Merrill, ll.cc.

N. matangensis W. W. Smith in Notes Roy. Bot. Gard. Edinb. **8,** 323 (1915), pro maiore parte ; Merrill, l.c. 550 (1921), pro maiore parte.

Under *N. matangensis* nine specimens were cited, in chronological order, but none was designated as the type. Of the four specimens from Mt. Matang (the remainder being either from other localities

Neurocalyx elatus Valeton. Type specimen (Herb. Hort. Bogor.)

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or unlocalised), *Haviland* 682 is referable to *N. corollinus* Val., a species readily distinguished by the rounded base of the leaf-lamina and by the narrow sepals; *Ridley* 11,750 differs from all others in the very short adpressed pubescence of the leaves and in the absence of long setulae on the capsule, and is here treated as a variety of *N. borneënsis* Val.; *Native Collector* 104 is again *N. corollinus*; and *Native Collector* 244 agrees well with the type of *N. borneënsis*. The remaining specimens are referable as follows: *Lobb* s.n. to *N. borneënsis*; *Beccari* 1695 to *N. corollinus*; *Beccari* 2965 to *N. borneënsis*: *Haviland* 677 to *N. borneënsis* var. nov.; and *Haviland & Hose* 3412 to *N. borneënsis* var. nov. altera. In view of the fact that three of the four specimens cited from Mt. Matang (as well as three others) agree with the types of previously described species, it seems advisable to abandon the epithet *matangensis* altogether, rather than employ it even varietally for the one Matang specimen (*Ridley* 11,750) which does actually represent a new form.

var. **typicus** *Airy-Shaw*, var. nov. omnibus partibus longe strigosis.

Dutch Borneo: West Division. Landak, *Teysmann* s.n. (lectotypus, Herb. Kew.) et 11,222. Ad pedem montis Damoer*, *Hallier* B. 499 (teste Valeton; non vidi).

Sarawak. Sine loc. exact., sandstone rocks, 750 m., *Lobb*. Sine loc. exact., *Beccari* 2965. Puak, Sept. 1905, *Ridley* 12,451. Matang, 5 Dec. 1913, *Native Collector* E 244 (Herb. Edin.). Ibid., 2 Jan. 1915, *Ridley* s.n. (Herb. Mus. Brit.).

var. **typicus** forma **micranthus** *Airy-Shaw*, f. nov. inflorescentia brevissima congesta, floribus parvis, sepalis 2–3 mm. tantum longis.

Sarawak. Baram, May 1894, *Haviland & Hose* 3412 (typus, Herb. Kew.). Matang, Jan. 1915, *Ridley* s.n.

var. **oligotrichus** *Airy-Shaw*, var. nov. pilis foliorum pagina superiore brevibus circiter 1 mm. longis sparsis, ceteris partibus minus strigosis.

Sarawak. Sepudang, 1891, *Haviland* 677 (c.k.o.e.): "Herb, 3 ft.; corolla white, tube short."

var. **brachytrichus** *Airy-Shaw*, var. nov. foliis undique pilis minimis adpressis crebre vestitis.

Sarawak. Matang, July 1893, *Ridley* 11,750. The following is provisionally referred here:—Ulu Koyan, shaded sandstone cliff, *c.* 800 m., 22 Sept. 1932, *Richards* 2023: "Flower buds pink."

var. **dulitensis** *Airy-Shaw*, var. nov. foliis minoribus supra praeter costam fere glabris, nervis primariis lateralibus angulo recto vel fere recto ortis.

Sarawak. Baram, Mt. Dulit, 900–1500 m., March 1894, *Haviland & Hose* 3533. Bakam, 20 May 1895, *Haviland & Hose* (B.M. no.) 2026. Mt. Lambia, 150 m., 23 May 1895, *Haviland & Hose* (B.M. no.) 2025. Mt. Dulit, 1200–1500 m., Jan. 1923, *Mjöberg* 5.

* Probably an error for Damoes (Damus), in the Landak district: *cf.* Molengraaff in Peterm. Geogr. Mitteil. **41**, 202 (1895).

Dulit Trail, *c.* 800 m., moist mossy rocks in slight shade, 27 Aug. 1932, *Richards* 1482 (typus, Herb. Kew.) : " Petals white, somewhat translucent. Leaves rugose, veins and petioles red." Ibid., wet rocks in shade, 29 Aug. 1932. *Richards* 1538 : " Fls. white. Leaves rugose."

var. **dulitensis** forma **pubescens** *Airy-Shaw*, f. nov. foliis supra longe dense patule pubescentibus.

Sarawak. Dulit Ridge, *c.* 1200 m., wet rocks in spray of waterfall, 10 Sept. 1932, *Richards* 1676 : " Petals white."

The variety *dulitensis* is perhaps sufficiently distinct to rank as a species, but, in the absence of any floral distinctions, and in view of the seemingly great variability of *N. borneënsis*, it seems preferable to treat it for the present as a variety. More ample material may also provide intermediates between the first three varieties.

The field notes of Lobb and of Richards again bring out the preference of *Neurocalyx* for sandstone. Mt. Matang is of the same formation (*cf.* Scrivenor in Journ. Mal. Br. R. As. Soc. **5**, 292 : 1927). The occurrence of the genus at elevations of 150 m. and less in the neighbourhood of the coast (Bakam, between Mt. Lambir and the sea) is noteworthy.

5. **Neurocalyx corollinus** *Valeton*, l.c. 513 (1913) ; Merrill, ll.cc.

N. matangensis W. W. Smith, l.c., pro minore parte ; Merrill, l.c., pro minore parte.

Sarawak. Prope Kuching, *Hewitt* (typus, Herb. Bog. ; non vidi). Mt. Santubong, March 1906, *Hewitt* (Herb. Lugd. Bat.). Sine loc. exact., *Beccari* 1695. Matang, 900 m., 1891, *Haviland* 682 (c.l.n.m.). Ibid., 1 Dec. 1913, *Native Collector* E 104 (Herb. Edin.). Ibid., Jan. 1915, *Ridley* s.n. (Herb. Mus. Brit.).

From the collections examined, *N. corollinus* appears to be a well-defined entity. It is certainly close to *N. borneënsis*, but the characters of leaf-base and calyx-segments mentioned above (p. 289) are constantly associated and easily observable. It will be noticed that both are covered by Wright Smith's description of *N. matangensis* : " Folia . . . basi . . . rarius subrotundata " ; " Calycis . . . lobi . . . nunc omnes subaequales lanceolati." The significance of the epithet *corollinus* is not clear ; it was perhaps chosen as an antithesis to that of the S. Indian species *N. calycinus* (R. Br.) B. L. Robinson, but the corolla of the present species is in no way remarkable.

Two undescribed species are probably represented by the following collections in Herb. Kew. : Sarawak, sine loc. exact., *Beccari* 3953 ; Matang, 28 Aug. 1905, *Ridley* s.n. They are considerably smaller than any of the known species. Unfortunately, however, the material does not permit of adequate description.

XXVI—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXI.*

PLANTAE MEXICANAE HINTONIANAE: III.†

This is a further contribution based upon Mr. G. B. Hinton's large Mexican collections, which now include over 10,000 numbers, all gathered in the small area comprising the adjoining districts of Temascaltepec, Coyuca and Huetamo, situated in the states of Mexico, Guerrero and Michoacan respectively. The collection is perhaps the most intensive that has ever been made in Mexico. It is especially important because many of the species which were collected by Sessé and Mociño, Jurgensen, Hartweg, Ehrenberg and others, in the same area, and which have remained more or less obscure or incompletely known, have been elucidated by Mr. Hinton's rediscoveries. A typical example is *Gentiana salpinx* Griseb., collected by Ehrenberg in Temascaltepec in 1831. Mr. Hinton collected this again in 1932 and subsequently, and a figure, prepared from his specimens, has appeared in "Hooker's Icones Plantarum" t. 3299.

MALVACEAE (A. A. Bullock).

Malvaviscus Hintoni *Bullock*, sp. nov.; *M. Conzattii* Greenm. affinis, sed floribus albidis, auriculis petalorum longioribus oblongis angustioribus, bracteis involucri calycem haud superantibus linearibus angustioribus setoso-pilosis, indumento densiore differt.

Frutex ramosus, 2–6 m. altus; rami ramulique dense stellato-tomentosi, annotini cicatricibus foliorum delapsorum tuberculati. *Folia* plerumque ovata, interdum lanceolata, interdum subtrilobata vel manifeste trilobata, usque ad 7·5 cm. longa et 4 cm. lata sed plerumque circiter 5 cm. longa et 2–2·5 cm. lata, apice obtusiuscula vel obtusiuscule acuminata, basi rotundata vel subtruncata vel interdum subcordata, marginibus subdistanter (interdum subduplicite) serrata, serraturis acutis vel obtusiusculis, utrinque plus minusve pilis stellatis 2–5-radiatis et simplicibus intermixtis pubescentia vel fere glabra; petioli pubescentes, usque ad 2·5 cm. longi sed saepe breviores; stipulae dense pilosae, deciduae, linearilanceolatae, usque ad 7 mm. longae. *Flores* albidi, solitarii, ex axillis foliorum orti, versus apices ramorum aggregati; pedunculi graciles, dense stellato-pubescentes, usque ad 2·5 cm. longi sed saepissime 1–1·5 cm. longi. *Bracteae* involucri 6–8, basi tantum coalitae, lineares, usque ad 1 cm. longae sed saepe breviores et calycem nunquam excedentes, saepissime setoso-pilosae et plus minusve pubescentes vel nonnunquam villosae. *Calyx* saltem 1 cm. longus, plerumque circiter 1·3 cm. longus, raro usque ad 1·5 cm. longus, extra pilis stellatis dense pubescens vel interdum lanato-tomentosus; lobi 3, inaequales, oblongo-ovati vel oblongi, acuti,

* Continued from K.B. 1937, 112.

† The two previous articles appeared in K.B. 1936, 1, and K.B. 1936, 387, under slightly different titles.

circiter 5 mm. longi. *Petala* 5, ambitu cuneato-obovata, circiter 4 cm. longa et 1·5–1·8 cm. lata, erecta, convoluta, superne altero latere oblique truncato cito angustata, apice oblique late obtuse cuspidato-rostrata, altero latere 5 mm. supra basin auricula* patente vel leviter recurva oblonga apice rotundata 5 mm. longa 3 mm. lata instructa, nonnunquam altero latere 2 mm. supra basin auricula usque ad 1 mm. diametro instructa, extra intusque glabra vel pilis paucis praedita, auriculis manifeste ciliatis. *Columna staminalis* circiter 5·5 cm. longa, praesertim apicem versus spiraliter torta, glaberrima, apicem versus antheris circiter 20 instructa, apice 5-dentata; filamenta filiformia, 2·3 mm. longa; antherae ellipsoideae, 1 mm. longae. *Stylus* exsertus, ramis 7–8 apice clavatis 4 mm. longis. *Ovarium* depresso-ovoideum, acutum, 2 mm. longum, 3 mm. diametro. *Fructus* rubri, depresso-globosi, apice umbilicati, 6 mm. longi, 8 mm. diametro, 5-costati, costis supralocularibus, 5-canaliculati, canaliculis interlocularibus, sicco leviter transversim reticulati.

State of Mexico. District of Temascaltepec: Tejupilco, 1340 m., May 1932 (fl.), *Hinton* 690, " Grows in the forest, 3 m. high "; *ibid.*, May 1933 (fl.), *Hinton* 3928 (type), " On a stone fence, 3 m. high "; *ibid.*, July 1933 (fl.), *Hinton* 4289; *ibid.*, Oct. 1933 (fl., fr.) *Hinton* 5057, " On a stone fence, a shrub, 2 m. high."; *ibid.*, 1400 m., Dec. 1933 (fl.), *Hinton* 5371, " Common in barrancas, also introduced into gardens for the beauty of the snow-white flower "; *ibid.*, by the river, June 1935 (fl., fr.), *Hinton* 7912, " Shrub 6 m. high."

Vernacular name: *Monacillo.*

Mr. Hinton adds the notes that the fibre of this species is used as a textile for the manufacture of sacks, and also that fruiting specimens are very rare.

Tiliaceae (A. A. Bullock and T. A. Sprague).

Triumfetta columnarioides *Bullock*, sp. nov.; peraffinis *T. columnari* Hochr. sec. Standl.† sed foliis minoribus supra minus pilosis subtus haud villoso-tomentosis, calyce extra brevissime plus minusve dense stellato-piloso haud longe piloso nec glabro differt.

Frutex 1·5–2 m. altus; rami ramosi, graciles, circiter 2 mm. diametro 4 dm. infra apicem, primum pilis stellatis minutis multiradiatis atque pilis longioribus simplicibus vel 2–3-radiatis leviter induti. *Folia* ovata, 3·5–7 cm. longa, 2–3·5 cm. lata, interdum leviter 3-lobata, apice longiuscule acuminata, basi truncata vel rotundata vel saepe leviter cordata, e basi 3–5-nervia, marginibus subdupliciter serrata, utrinque plus minusve pilis 1–3-radiatis hirsutula et in nervis venulisque pilis stellatis multiradiatis minutis

* This description of the auricles applies only to herbarium specimens which have been soaked in water and dissected; in life they are tightly convolute around the staminal column, and their function, unless it is simply the mechanical one of holding the petals vertically, is obscure.—A.A.B.

† Standley in Contrib. U.S. Nat. Herb. **23,** 744 (1923).

leviter et irregulariter induta ; petioli graciles, pilosi, 1–2·5 cm. longi. *Cymulae* 3-florae, simul axillares et laterales et oppositifoliae, apices ramorum versus plus minusve confertae ; pedunculi satis dense pilosi, 5–7 mm. longi ; pedicelli similes, 5–7 mm. longi, supra basin articulati ; bracteae deciduae, lanceolato-subulatae, circiter 4 mm. longae. *Sepala* linearia, 2·5 cm. longa, 1·5–2 mm. lata, apice appendicibus 1·5–2 mm. longis coronata, extra pilis minutis stellatis multiradiatis satis dense induta, intus glabra. *Petala* ligulata vel superne leviter ampliata, acuta, circiter 2 cm. longa et 2 mm. lata, parte inferiore 2 mm. longa extra villosa intus apice linea villosa transversa praedita. *Andrógynophorum* 2 mm. longum, glandulis 5 paullo brevioribus oblongis inter se distinctis praeditum, apice annulo distincto breviter ciliato coronatum. *Stamina* 20, filamentis filiformibus 1·8 cm. longis basin versus leviter villosis et ibidem leviter dilatatis, antheris oblongis 0·5 mm. longis. *Ovarium* globosum, 1 mm. diametro, dense echinulatum ; stylus filiformis, fere 2 cm. longus, apice brevissime bifidus. *Fructus* (vix maturi) globosi, cum aculeis 8 mm. diametro, plus minusve minute puberuli sed aculeis glabris vel basin versus tantum puberulis ; aculei numerosi, rigidi, recti, 3 mm. longi, apice spinula unica uncinati.

State of Mexico. District of Temascaltepec : Comunidad, 2350 m., Oct. 1933, *Hinton* 4891, " Oak woods, 2 m. high " ; *ibid.*, 2300 m., Oct. 1933, *Hinton* 4917 (type), " Forest, 1·5 m. high. This collection is of different locality from No. 4891."

Triumfetta heliocarpoides *Bullock*, sp. nov. ; peraffinis *T. Galeottianae* Turcz., sed indumento multo breviore, foliis subtus albicantibus, floribus minoribus in inflorescentias ramosas dispositis, fructibus longius aculeatis, aculeis manifeste longioribus differt.

Frutex vel *suffrutex*, ramosus, 1–1·5 m. altus ; rami ramulique pilis stellatis minutis tomentelli, medullosi, circiter 4 mm. diametro 20 cm. infra apicem, medulla 2 mm. diametro. *Folia* interdum subtrilobata, rotundato-obovata vel (superiora) ovata vel oblongo-ovata, inferiora usque ad 16 cm. longa et 11 cm. lata, superiora multo minora, apice acute acuminata vel acuta, basi satis profunde cordata vel (superiora) rotundata, subdupliciter serrata, e basi 5–7-nervia, supra pilis minutis stellatis satis dense puberula, viridia, nervis venisque haud prominentibus interdum leviter impressis, infra pilis similibus densissime induta, albicantia, nervis venisque prominentibus reticulata ; petioli usque ad 10 cm. longi, superiores gradatim breviores, dense stellato-puberuli ; stipulae pro genere magnae, lanceolatae, 6 mm. longae, 2 mm. latae, acutae, demum deciduae. *Flores* versus apicem ramorum in inflorescentias magnas thyrsoideo-ramosas multifloras confertae ; cymulae ultimae triflorae, pedunculis 4 mm. longis, pedicellis subaequilongis ; rami ramulique inflorescentiarum dense stellato-tomentelli. *Alabastra* extra pilis minutis stellatis satis dense induta, 3–4 mm. longa, plus minusve clavata, infra medium leviter constricta, apice appendicibus vix

0·5 mm. longis coronata. *Sepala* linearia, superne leviter ampliata, 4 mm. longa, vix 1 mm. lata, apice acuta, intus glabra. *Petala* minuta, vix ultra 1 mm. longa et 0·5 mm. lata, obovata, apice rotundata dimidio inferiore extra villosa, intus medio linea transversa villosa, ceterum glabra. *Androgynophorum* circiter 0·75 mm. longum, glandulis 5 brevioribus distinctis oblongo-ellipticis praeditum, apice annulo angusto brevissime ciliato coronata. *Stamina* circiter 25, filamentis filiformibus basin versus brevissime pilosis 2–2·5 mm. longis, antheris oblongis circiter 0·3 mm. longis. *Ovarium* ovoideum, vix 0·5 mm. longum, vix echinulatum ; stylus glaber, 1·5 mm. longus. *Fructus* ellipsoidei vel globosi, corpore ipso 3 mm. longo, 2·25 mm. diametro, glabro ; aculei pro rata pauci (circiter 20), recti, glabri, 3·5 mm. longi, spinula unica uncinata terminati.

State of Mexico. District of Temascaltepec : Ixtapan, 1000 m., Nov. 1933 (fl., young fr.), *Hinton* 5159 (type), " Shrub 1 m. high " ; *ibid.*, on a hill, Nov. 1934 (fr.), *Hinton* 7001, " Shrub 1·5 m. high " ; Tejupilco, in a barranca, Oct. 1934 (fl.), *Hinton* 6779, " Shrub 1·5 m. high " ; *ibid.*, Oct. 1934 (fl.), *Hinton* 6780, " Shrub 1 m. high."

Vernacular name : *Guasima.*

Triumfetta Hintonii *Sprague,* sp. nov. ; fructibus oblongo-ellipsoideis, aculeis paucis brevibus incurvis perdistincta.

Frutex 2·5–4 m. altus, caule inferne circiter 2 cm. diametro, cortice areolis rhomboideis elevato-reticulato ; ramuli graciles, 3–4 mm. diametro 4–6 dm. infra apicem, superne stellato-puberuli, inferne glabrati ; internodia 3–5 cm. longa. *Folia* anguste ovata usque lanceolata, manifeste acute acuminata, in basin perangustam subtruncatam vel subcordatam plus minusve cuneata, 3–8 (11) cm. longa, 1–3·5 (4·5) cm. lata, tenuiter herbacea, basi 5-nervia, nervis ceteris utrinque circiter 3, crebre subdupliciter serrata, supra pilis sparsis stellatis atque simplicibus basi bulbosis puberula, subtus mesophyllo minute punctato, venulis nervisque fulvo-stellato-puberulis, nervis subtus inferne necnon supra axillos venarum lateralium pilis simplicibus albidis patule hirsuta ; petioli (0·3) 0·5–2·5 cm. longi, purpurei, pilis fulvis stellatis furfuraceo-pubescentes vel puberuli. *Ramuli floriferi* graciles, acute ascendentes, 1–4 dm. longi, bracteis foliaceis anguste lanceolatis vel oblongo-lanceolatis 1·5–4 cm. longis 0·4–1 cm. latis ; cymulae triflorae, pedunculatae, usque quaternae juxta folia ; pedunculi plerumque 3–5 mm. longi, pedunculus unus quisque juxta folium interdum bracteis foliaceis inferius instructus, cymulas circiter 4 gerens ; pedicelli 2·5–4 mm. longi, infra medium articulati, minute stellato-pubescentes. *Alabastra* matura 9–10 mm. longa, inferne ampliata, deinde leviter constricta, superne angustata, appendiculis circiter 0·3 mm. longis. *Sepala* 10 mm. longa, medio 0·7 mm. lata, extra minute stellato-puberula, inferne sparse tantum, in insertionem valde incurva ; pars inferior ampliata, convexa, oblongo-elliptica, vix ultra 2 mm. longa, intus a basi per 1·5 mm. glabra marginibus stellato-pubes-

centibus exceptis ; sepalum intus deinde per 1·5 mm. densiuscule stellato-pubescens, ceterum glabrum ; pars superior linearilanceolata, apiculo 0·4 mm. longo. *Petala* vix 7 mm. longa, brevissime anguste unguiculata ; pars basalis sursum sensim ampliata, apice 0·8 mm. lata, extra breviter villosa, intus linea villosa a parte superiore disjuncta ; pars superior oblanceolata, 4·5 mm. longa, 1·5–1·7 mm. lata. *Androgynophorum* cum annulo vix ultra 1 mm. longum ; glandulae subquadratae, 0·6 mm. longae et latae, fere contiguae ; annulus 0·3 mm. altus, breviter ciliatus. *Stamina* 16–19 ; filamenta usque ad 8 mm. longa, glabra ; antherae 0·7 mm. longae. *Ovarium* breviter oblongo-ellipsoideum, glabrum, biloculare, tuberculis spinuliferis circiter 11–14 echinatum ; spinula cum tuberculo suo 0·4 mm. longa ; stigmata 2. *Fructus* oblongo-ellipsoidei, 6 mm. longi, 3·5 mm. diametro, pro genere sparse aculeati, triente inferiore inermes, glabri, viridi-fusci ; aculei incurvo-ascendentes, circiter 1 (– 1·5) mm. longi.

State of Mexico. District of Temascaltepec : La Labor, 2000 m. fr. July, *Hinton* 980 ; *ibid.*, by the water, fl. and fr. May, *Hinton* 3837, 3883 ; *ibid.*, fl. Oct., *Hinton* 6594 ; Cajones, on a hill, 2480 m., fl. July, *Hinton* 4224 ; Nanchititla, by the water, fr. Dec., *Hinton* 5324 ; Cumbre de Tejupilco, in oak woods, fl. Nov., *Hinton* 7018 (type) ; Pantoja, in oak woods, fr. Nov., *Hinton* 7027.

Triumfetta Purpusii *Standl.* in Publ. Field Mus. Chicago, Bot. Ser. **11,** 167 (1936).

State of Vera Cruz. Matazaeza, March 1923 (fl., fr.), *Purpus* 9009 (type in Field Mus. Herb., fragment in Kew Herb.) ; rocky places near Rancho Remudadero, Feb. 1930 (fl., fr.), *Purpus* 13065 (Kew Herb.).

Standley cited also *Purpus* 11099 from Remudadero, but this specimen, apparently, has been mislaid. The type was kindly sent on loan from the Field Museum to Kew, where comparison of *Purpus* 13065 with the description had revealed certain discrepancies. The sepal appendages in the type are 7–8 mm. long, those in the Kew specimen only 4–5 mm. long. Of the petals, Standley says " . . . lineari-ligulata sepalis subaequalia." The petals in the Kew specimen, on dissection of a bud just before anthesis, were found to be broadly obovate, and only half as long as the sepals, but re-examination showed that this was a juvenile state, and that on anthesis the petals elongate without, however, increasing in width. They thus become oblanceolate or oblanceolate-spathulate, and about three quarters of the length of the sepals. Standley's " sepalis subaequalia " is, I think, a little misleading, though it must be admitted that in all the open flowers on the type the petals are very withered, and extremely difficult to dissect satisfactorily.—A. A. B.

Triumfetta quercetorum *Bullock*, sp. nov. ; habitu (quoad ramulos abbreviatos) *T. Palmeri* S. Wats. accedens, sed foliis plerumque minoribus minus pilosis tenuioribus, serraturis regularibus

minus profundis, calyce pilis minutis stellatis satis dense induto haud villoso-tomentoso recedit; a *T. columnari* Hochr. foliis brevius petiolatis angustioribus haud basi cordatis minus pilosis, calyce minute stellato-piloso nec pilis paucis simplicibus atque stellatis intermixtis leviter pubescente facile distinguenda; a *T. longicuspide* Turcz. habitu graciliore, foliis minoribus brevius petiolatis, ramulis abbreviatis ex axillis foliorum exortis, floribus minoribus, calyce satis dense minute stellato-piloso appendicibus brevioribus, androgynophoro longiore recedit.

Frutex 1–3 m. altus; rami teretes, graciles, 2–3 mm. diametro 4 dm. infra apicem, ramosi, ramulos abbreviatos foliatos axillares gerentes, novelli pilis minutis stellatis satis dense induti. *Folia* lanceolata usque ovata, plerumque 4–9 cm. longa, 1·5–3 cm. lata, apice longuiscule acuminata, basi obtusa vel rotundata, e basi 3-nervia, utrinque plus minusve pilis satis rigidis hirsutula et in nervis venisque praesertim pilis minutis stellatis leviter pilosa, serrata, serraturis acutis vel obtusis et saepe glanduliferis; petioli circiter 5 mm. (usque ad 1 cm.) longi. *Inflorescentiae* versus apices ramorum confertae, pluriflorae, nonnunquam bracteas foliaceas 1–2 gerentes, cymulis ultimis trifloris fasciculatis vel pedunculatis; pedunculi nulli vel usque ad 3·5 cm. longi; pedicelli circiter 6 mm. longi, sicut pedunculi minute stellato-pilosi; bracteae parvae, lineares, mox deciduae. *Alabastra* 1·5–2 cm. longa, subcylindrica, inferne leviter ampliata, minute stellato-pilosula, appendicibus subulatis 1 mm. longis coronata. *Sepala* 5, intus glabra, linearia, 1 mm. lata, basin versus levissime latiora et ibidem breviter ciliata. *Petala* 5, parte inferiore 2·5 mm. longa lineari breviter villosa, parte superiore lineari-oblanceolata acuta 7·5 mm. longa glabra. *Androgynophorum* 1·5 mm. longum, glandulis 5 distinctis oblongo-ellipticis paullo brevioribus praeditum, apice annulo angusto glabro coronatum. *Stamina* 20, filamentis 1·5 cm. longis filiformibus basin versus levissime ampliatis et ibidem breviter villosis, antheris oblongis 1 mm. longis. *Ovarium* globosum, 1 mm. diametro, echinulatum, stylo filiformi 1·2 cm. longo apice brevissime bifido. *Fructus* echinati, cum aculeis usque ad 1 cm. diametro, plus minusve puberuli; aculei numerosi, rigidi, plus minusve arcuato-recurvi, 2–3 mm. longi, spinula unica recta ascendente vel plus minusve recurva terminati.

State of Mexico. District of Temascaltepec: Rincón del Carmen, 1340 m., Oct. 1932, *Hinton* 1935, "By the water, 1 m. high"; Nanchititla, Jan. 1933, *Hinton* 3082, "Oak woods, 3 m. high"; *ibid.*, Oct. 1933, *Hinton* 4962, "Oak woods, 1·5 m. high"; Pungarancho, 950 m., Nov. 1935, *Hinton* 5253, "Oak woods"; *ibid.*, Oct. 1934, *Hinton* 6746 (type), "1 m. high, see 5253 from same place"; Ypericones, Nov. 1934, *Hinton* 6996, "Oak woods, 1·5 m. high."

Malpighiaceae (A. A. Bullock).

Byrsonima crassifolia (*Linn.*) *H. B. K.* Nov. Gen. et Sp. **5,** 149 (1822); Standl. in Contrib. U.S. Nat. Herb. **23,** 564 (1923);

Niedenzu in Engl. Pflanzenr. Malpigh. 718 (1928) ; Morton in Publ. Carnegie Inst. Washington, No. 146, 140 (1936).

State of Mexico. District of Temascaltepec : El Picacho (mountain near Tejupilco), 1600 m., June 1932, *Hinton* 717, " Shrub 4 m. high ; the fruit is common in the markets " ; San Lucas del Maiz, Feb. 1933, *Hinton* 3324 ; Tejupilco, March 1932, *Hinton* 445 ; *ibid.*, 1340 m., July 1933, *Hinton* 4382.

State of Guerrero. District of Coyuca : Pungarabato, on a hill, April 1934, *Hinton* 5950, " A shrub 2 m. high."

Vernacular names : *Nanche, Nanche de Zorro.*

Although Niedenzu described numerous forms of this very variable and widely distributed plant he evidently had not the opportunity of examining all the material at Standley's disposal, for he maintained, in addition to *B. crassifolia*, all the species which Standley had rightly reduced as being founded on characters which are not correlated and which are normally variable ; this view was also maintained by Morton. The reduced species were *B. cotonifolia*, H. B. K., *B. oaxacana* Juss. and *B. Karwinskiana* Juss.

Malpighia punicifolia *L.* Sp. Pl. ed. 2, 609 (1762) ; Small in N. Amer. Fl. **25**, 156 (1910) ; Standl. in Contrib. U.S. Nat. Herb. **23**, 566 (1923) ; Niedenzu in Engl. Pflanzenr. Malpigh. 622 (1928).

State of Guerrero. District of Coyuca : Coyuca—Querendas, in a barranca, June 1934, *Hinton* 6132.

Niedenzu records this plant from Oaxaca and Yucatan, in addition to its range in the West Indies and northern South America. Its distribution in Mexico evidently requires further investigation.

Malpighia Hintoni *Bullock*, sp. nov. ; affinis *M. cordatae* Small, sed foliis multo majoribus supra fere glabris subtus adpresso-pilosis vix tomentosis, floribus minoribus ut videtur numerosioribus, tubo staminali 1 mm. (nec 4 mm.) longo facile distinguenda.

Frutex " 2·5 m. altus " (*Hinton* 4489, 4736), vel " *arbor* 5 m. alta " (*Hinton* 8051), vel " *arbor magna* " (*Hinton* 1192) ; ramuli novelli villoso-tomentosi, demum cortice fibroso griseo-brunneo induti. *Folia* opposita, rotundato-elliptica vel latissime elliptica, nonnunquam plus minusve late obovata, usque ad 10 cm. longa et 8 cm. lata (*Hinton* 1192), vel circiter 7 cm. longa et 4·5 cm. lata (*Hinton* 4489), apice rotundata vel acutiuscula, nonnunquam breviter late cuspidata, basi late rotundata, vix truncata vel subcordata, supra glabra vel in costa et nervis tantum pubescentia, subtus persistenter pubescentia vel villosa vel lanata, vix tomentosa, costa et nervis lateralibus (utrinsecus circiter 6) arcuato-adscendentibus prominentibus ; petioli tomentosi, circiter 5 mm. longi, eglandulosi. *Racemi* in axillis foliorum solitarii vel bini, floribus apicem versus in axillis bractearum dense confertis ; pedunculi tomentosi, sub anthesin 1–1·3 cm. longi, nonnunquam longiores, medio bracteis 2 foliaceis oppositis instructi ; pedicelli ex axillis bractearum orti, oppositi vel 3–4-natim verticillati, tomentosi, circiter 1 cm. longi, infra medium vel basin versus bracteolis

2 oppositis vel suboppositis instructi ; bracteae atque bracteolae triangulares vel subulatae, acutae, usque ad 3 mm. longae, tomentosae. *Sepala* ovata, 3–4 mm. longa, 2 mm. lata, apice obtusiuscula, basi glandulis 2 carnosis glabris lateralibus dimidio brevioribus praedita, extra ceterum villoso-pilosa, intus minute papillosa, in insertionem valde incurva, superne sub anthesin inter petala incurva. *Petala* unguiculata, patentia ; unguis carnosus, 3 mm. longus ; lamina rotundato-obovata, 6–7 mm. longa, 5–6 mm. lata, marginibus fimbriata, extra intusque glabra. *Stamina* 10 ; filamenta applanata subulata, basi in tubum 1 mm. longum coalita, partibus liberis circiter 0·75 mm. longis ; antherae oblongae, 1·5 mm. longae, 0·75 mm. latae, introrsum dehiscentes. *Ovarium* ovoideum vel ovoideo-globosum, 2 mm. longum, 2 mm. diametro, glabrum, apice stylis 3 carnosis 2 mm. longis coronatum, stylo uno quam ceteris tenuiore. *Fructus* immaturi globosi, 6 mm. diametro.

STATE OF MEXICO. District of Temascaltepec : Vigas, 1080 m., July 1932, *Hinton* 1192 (type) ; Luvianos, July 1933, *Hinton* 4489 ; Limones, 910 m., Sept. 1933 (young fr.), No. 4736 ; *ibid.*, July 1935 (fl.), No. 8051.

This species does not fit into any part of Standley's key in his " Trees and Shrubs of Mexico " (p. 565) and is easily distinguished from all the species which he lists by its large broadly ovate or rotundate leaves, which are almost glabrous above but densely adpressed-hairy below. The loan of the type of *M. cordata* Small, from the United States National Herbarium, is gratefully acknowledged.

Thryallis Palmeri *Rose* in Contrib. U.S. Nat. Herb. **12,** 281 (1909) ; Small in N. Amer. Fl. **25,** 151 (1910) ; Standl. in Contrib. U.S. Nat. Herb. **23,** 569 (1923). *Galphimia glandulosa* Rose in Contrib. U.S. Nat. Herb. **5,** 137 (1897), non Cav. (1797). *G. paniculata* Bartl. var. *glandulosa* (Rose) Niedenzu in Engl. Pflanzenr. Malpigh. 599 (1928).

STATE OF GUERRERO. Near Acapulco, Oct. 1894–March 1895 (fl.), *Palmer* 474 (type in U.S. Nat. Herb.).

STATE OF MEXICO. District of Temascaltepec : Pineda, on a hill, Jan. 1933, *Hinton* 3195 ; Nanchititla, on a hill, Feb. 1933, *Hinton* 3411 ; *ibid.*, in an oak forest, Feb. 1935, *Hinton* 7354 ; Platanal, in oak woods, March 1934, *Hinton* 5749 ; Palmar, on a hill, March 1935, *Hinton* 7528.

According to the literature cited above, this plant was previously known only from the type collection, so that Mr. Hinton's specimens, which match the type, constitute an important new record of the species. It is a suffruticose plant up to a metre in height, the annual (?) stems arising from a thick, woody rootstock. The type specimen in the United States National Herbarium, was kindly sent on loan to Kew for comparison with Mr. Hinton's specimens.

Heteropteris* portillana *S. Wats.* in Proc. Amer. Acad. **22,** 402 (1887) ; Niedenzu in Engl. Pflanzenr. Malpigh. 312 (1928). *Banisteria*

* The generic name *Heteropteris* A. Juss. is conserved.

portillana (S. Wats.) C. B. Robinson ex Small in N. Amer. Fl. **25,** 135 (1910) ; Standl. in Contrib. U.S. Nat. Herb. **23,** 577 (1923).

State of Mexico. District of Temascaltepec : Salitre, 1300 m., Dec. 1932, *Hinton* 3003.

This species was known previously only from the *locus classicus,* near Guadalajara in the State of Jalisco, where both Palmer and Pringle collected it. Niedenzu in a note says " Haec species antecedenti [*Heteropterys Gayana* Juss.] maxime affinis est, forsan subspecies cum ipsa conjungenda." The two species are, however, readily separable, by the various key characters given by Niedenzu and Standley respectively.

Heteropteris cotinifolia *Juss.* in Ann. Sc. Nat. Sér. II. **13,** 274 (1840) ; Niedenzu in Engl. Pflanzenr. Malpigh. 311 (1928). *Banisteria cotinifolia* (Juss.) C. B. Robinson ex Small in N. Amer. Fl. **25,** 134 (1910) ; Standl. in Contrib. U.S. Nat. Herb. **23,** 577 (1923). *Heteropteris pallida* Brandeg. in Univ. Calif. Publ. Bot. **6,** 182 (1915). *Banisteria pallida* (Brandeg.) Standl. *l.c.*

State of Oaxaca. Totolapa, Aug. (fl.), *Andrieux* 492 (type number, in Kew Herb.).

State of Guerrero. Iguala, Aug. 1905 (fl.), *Rose, Painter and Rose* 9426. District of Coyuca : Balderrama, Aug. 1934 (fl.), *Hinton* 6496 ; *ibid.* (from the same vine), Oct. 1934 (fr.), *Hinton* 6867.

A portion of Mr. Hinton's number 6867 was submitted to Dr. C. V. Morton, of the United States National Herbarium, for examination and comparison with the material at his disposal, and he replied, " *Hinton* 6867 and *Rose, Painter and Rose* 9426 are close matches for the type of *Banisteria pallida* (Brandeg.) Standl., and are undoubtedly referable to that species. I am unable to say whether or not Niedenzu is correct in considering *B. pallida* the same as *B. cotinifolia,* but it seems likely that that is true."

The writer has now carefully compared *Hinton* 6496 and 6867 with the type material of *H. cotinifolia* at Kew and concludes that they are conspecific.

Heteropteris Gayana *Juss.* in Ann. Sc. Nat. Ser. II. **13,** 274 (1840) ; Niedenzu in Engl. Pflanzenr. Malpigh. 312 (1928) quoad formam *typicam* Niedenzu, *l.c.* tantum. *Banisteria Gayana* (Juss.) C. B. Robinson ex Small in N. Amer. Fl. **25,** 135 (1910), quoad nomen tantum ; non Standl. in Contrib. U.S. Nat. Herb. **23,** 577 (1923).

State of Oaxaca. Guichiloma, between Tehuantepec and Guazacualcos River, Sept. (fr.), *Andrieux* 494 (type number in Kew Herb.).

Some doubt having arisen as to the validity of the treatment of this species by Small, Standley, and Niedenzu, a few samaras of *Andrieux* 494 were sent to Dr. Morton for comparison with material called " *B. Gayana* " in the United States National Herbarium. He replied, " The samaras of *Andrieux* 494, the type of *Banisteria*

Gayana, are not matched in the U.S. National Herbarium. You are quite right that the species treated by Standley and also by Small as *B. Gayana* is different and is *H.* [*Heteropteris*] *Gayana* f. *acapulcensis* Ndzu. pro parte. It is, I believe, more than a mere form and deserves specific rank. . . ."

The present writer concludes that *H. Gayana, sensu stricto*, has never been found since the type collection was made by Andrieux over a hundred years ago.

Heteropteris Palmeri *Rose* in Contrib. U.S. Nat. Herb. **1,** 311 (1895). *Banisteria Palmeri* (Rose) C. B. Robinson ex Small in N. Amer. Fl. **25,** 135 (1910); Standl. in Contrib. U.S. Nat. Herb. **23,** 577 (1923). *B. Gayana* Small in N. Amer. Fl. **25,** 135 (1910); Standl. in Contrib. U.S. Nat. Herb. **23,** 577 (1923); non *Heteropteris Gayana* Juss. (1840). *H. Gayana* forma *acapulcensis* Niedenzu in Engl. Pflanzenr. Malpigh. 312 (1928), saltem partim.

State of Sonora. Alamos, Sept. 1890 (fl. fr.), *Palmer* 655, 656 (co-type numbers in Kew Herb.).

State of Sinaloa. S. Ignacio, 450 m., May 1921 (fl.) *Ortega* 536; *ibid.*, 95 m., May 1921 (fr.), *Ortega* 641.

State of Colima. Manzanillo, Dec. 1890 (fr.), *Palmer* 1025.

State of Guerrero. Acapulco, Oct. 1894–March 1895 (fr.), *Palmer* 79.

The above treatment of *Heteropteris Palmeri* is based on the specimens at Kew, and on Dr. Morton's memorandum cited (in part) under *H. Gayana* above. It will be observed that its range includes almost the whole of the west coast of Mexico.

Mascagnia polybotrya (*Juss.*) *Niedenzu* in Arb. Bot. Inst. Lyc. Braunsberg, **3, 5** (1908), et in Engl. Pflanzenr. Malpigh. 94 (1928); Small in N. Amer. Fl. **25,** 120 (1910); Standl. in Contrib. U.S. Nat. Herb. **23,** 574 (1923). *M. Gouania* Small, *l.c.*; Standl. *l.c. Hiraea polybotrya* Juss. in Ann. Sc. Nat. Sér. 2, Bot. **13,** 260 (1840).

State of Mexico. District of Temascaltepec: Chorrera, 1230 m., Nov. 1932, *Hinton* 2631; Salitre, 1350 m., Nov. 1932, *Hinton* 2595; Limones, Nov. 1934, *Hinton* 6990.

Mr. Hinton's notes indicate that this is either a liane sprawling over other trees, or a shrub with pendulous branches.

There seems to be no adequate means of separating Small's *M. Gouania* from Jussieu's plant, the diagnostic characters given by both Small and Standley being found to be too variable. Standley was not thoroughly satisfied as to the validity of Small's species, for under *M. polybotrya* he says, "No material seen by the writer; perhaps the same as *M. Gouania*."

Mascagnia dipholiphylla (*Small*) *Bullock*, comb. nov. *Hiraea dipholiphylla* Small in N. Amer. Fl. **25,** 122 (1910); Standl. in Contrib. U.S. Nat. Herb. **23,** 572 (1923); Niedenzu in Engl.

Pflanzenr. Malpigh. 144 (1928), sub spp. incertae. *Mascagnia polycarpa* T. S. Brandeg. in Univ. Calif. Publ. Bot. **10,** 409 (1924).

State of Verz Cruz. Remudadero, April 1923 (fr.), *Purpus* 9019 (type of *M. polycarpa* in Univ. Calif. Herb.).

State of Morelos. Near Cuernavaca, 1500 m., Mar. 1899, *Pringle* 7730 (type, in Gray Herb.).

State of Mexico. Pungarancho, by the river, Jan. 1933, *Hinton* 3147 ; Tenayac, 1450 m., Feb. 1933, *Hinton* 3314 ; Guayabal, by the river, Feb. 1933, *Hinton* 3370 ; *ibid.*, from the same vine, March 1935, *Hinton* 7523 ; Limones, Jan. 1934, *Hinton* 5569 ; Chorrera, 1230 m., on a dry hill, March 1934, *Hinton* 5744 ; *ibid.*, in a barranca, March 1935, *Hinton* 7513 ; Ixtapan, in a barranca, March 1935, *Hinton* 7498. Without locality, *Parkinson* s. n. (in Herb. Hook. and Herb. Benth.).

This is reported also from Oaxaca by Standley, but I have seen no specimens from that State. The type specimen, kindly sent on loan to Kew by the authorities at the Gray Herbarium, is matched very exactly by Mr. Hinton's numbers 7498 and 7513, both of which have flowers and fruit. Thanks are also due for the loan of the type of *M. polycarpa* from the herbarium of the University of California.

Niedenzu apparently did not see this plant, for he included it under " uncertain species," with the note, " Num revera *Hiraea* ? "

In support of the above transference, it may be noted that the stipules are borne at the base of the petiole, the only character used by Small and Standley in their keys to the genera, though not one regarded as crucial by Niedenzu ; in addition, the inflorescence and leaves are those of a *Mascagnia* and the plant is indeed closely allied to *M. macroptera* (Sessé et Moc.) Niedenzu. Morton (in Publ. Carnegie Inst. Washington, no. 461, 127 : 1936) separates *Mascagnia* and *Hiraea* by the following key characters :—

" Stipules borne on the stems ; flower stalks articulate and bibracteolate above the base.....*Mascagnia*
Stipules borne on the petioles ; flower stalks not articulate, bibracteolate at the base.....*Hiraea.*"

The present plant shows that these characters are not mutually exclusive : it has " stipules borne on the stem " as for *Mascagnia*, and " flower stalks not articulate, bibracteolate at the base," as for *Hiraea.*

Gaudichaudia cynanchoides *H. B. K.* Nov. Gen. et Sp. **5,** 158, t. 445 (1822) ; Small in N. Amer. Fl. **25,** 129 (1910) ; Standl. in Contrib. U.S. Nat. Herb. **23,** 571 (1923) ; Niedenzu in Engl. Pflanzenr. Malpigh. 239 (1928). *H. mucronata* (Sessé et Moc. ex DC.) Juss. in Ann. Sc. Nat. Sér. 2, Bot. **13,** 253 (1840) ; Small *l.c.* 130 (1910) ; Standl. *l.c.*

State of Mexico. District of Temascaltepec : Rincón, 1960 m., Sept. 1932, *Hinton* 1704 ; Cumbre, 2485 m., Sept. 1932, *Hinton* 1695 ; Tejupilco, 1340 m., Oct. 1932, *Hinton* 2289.

There seems to be no reason for maintaining both *G. cynanchoides* and *G. mucronata*, and inspection of the plate and description of *G. cynanchoides* shows that Small's key diagnosis " Leaf-blades sessile or nearly so, narrowed to the base " is an error which Standley repeated. Morton (in Publ. Carnegie Inst. Washington, No. 461, 129 : 1936) points out that Standley's identification of *G. mucronata* in Yucatan is also faulty, so that the specimens he examined had probably become mixed and written up in error. Niedenzu's treatment, as far as the species go, is followed here, but the named varieties and forms which he enumerates are not, in the present writer's opinion, distinct taxonomic entities.

Gaudichaudia mollis *Benth.* Pl. Hartw. 6 (1839) ; Niedenzu in Engl. Pflanzenr. Malpigh. 244 (1928).

State of Mexico. District of Temascaltepec : Ixtapan, 1000 m., July 1932, *Hinton* 1170 ; *ibid.*, Sept. 1932, *Hinton* 1634.

Both Small and Standley list this as a doubtful species, whilst Niedenzu divides it into two varieties, of which I have seen only var. *Hartwegiana* Niedenzu. The description of this (the type) does not seem to be sufficiently distinct from that of var. *Pringleana* Niedenzu to warrant separate treatment.

Leguminosae (N. Y. Sandwith).

Nissolia leiogyne *Sandwith*, sp. nov. ; *N. Schottii* (Torr.) A. Gr. affinis, forma foliolorum, dentibus calycinis multo brevioribus, gynoecio fructuque maturo glaberrimis differt ; *N. Pringlei* Rose atque *N. diversifolia* Rose forma foliolorum, indumento calycis gynoecii fructus differunt.

Suffrutex scandens esetosus, ramulis gracilibus omnino glabris vel novellis inconspicue pubescentibus. *Stipulae* anguste lanceolato-subulatae, 2·5–4 mm. longae. *Folia* adulta glaberrima ; petiolus 0·6–2·4 cm. longus ; internodia rhacheos 0·4–1·5 cm. longa ; petioluli vulgo 1–2 mm. longi ; foliola 5, late obovata, rarius obovato-elliptica, saepius obcordata apice late rotundata retusa vel truncata, rarius rotundata tantum, semper ad 1 mm. mucronata, basin versus saepius attenuata sed basi ipsa rotundata vel saltem obtusa, magnitudine valde variabili, 0·3–2·3 cm. longa, 0·3–1·9 cm. lata, adulta chartacea, glaberrima, supra punctata, nervis lateralibus utroque costae latere 5–6, rete venularum in foliolis majoribus subtus manifesto intricato plano fere impresso. *Flores* axillares in quaque axilla usque 6, siccitate ad 8 mm. longi ; bracteae basi pedicellorum subulatae, 1–2 mm. longae, pubescentes ; pedicelli gracillimi, ad 7 mm. longi, glabri. *Calyx* tubo campanulato 2·5 mm. longo atque lato glabro ; dentes subulati, 0·75–1·25 mm. longi. *Petala* lutea ; vexillum cum ungue 8–9 mm. longum, ungue 1·5–1·8 mm. longo superne obscure ciliato, lamina applanata ovata 6–7·5 mm. longa 5–6 mm. lata basi rotundata haud auriculata ciliata extra praesertim inferne prope medium puberula vel glabrescente ; alae ungue 3 mm.

longo dimidio superiore dense ciliato-piloso, lamina oblongo-lanceolata 5·5–7 mm. longa 2–2·3 mm. lata ; carinae petala laminis dorso cohaerentibus, ungue 2·75–3 mm. longo glabro, lamina 5–6·5 mm. longa 2 mm. lata basi obscure ciliata. *Stamina* 5–5·5 mm. longa, vagina filamentisque glabris. *Gynoecium* omnino glaberrimum ; ovarium lineari-oblongum, 2·5–3 mm. longum, vix 0·6 mm. latum, stipite 0·5 mm. longo, sensim in stylum 1·5–2 mm. longum attenuatum ; ovula 2. *Fructus* totus 2·5–3 cm. longus, stipite ad 3·5 mm. longo, plus minusve falcato-curvatus, glaberrimus, articulis 1–2 valde costatis, inter articulos haud constrictus, ala articuli superioris conspicue reticulato-venosa apice acuta fere ad 8 mm. lata, stylo terminali.

State of Guerrero. District of Coyuca : Santa Barbara, in barranca, fl. and fr. July 14th, 1934, *Hinton* 6291 (typus) ; Chacamerito, fr. Sept. 19th, 1934, *Hinton* 6616 ; Tario, fl. June 11th, 1935, *Hinton* 7861. " Vine. Flowers yellow."

Caesalpinia (**Poincianella**) **Hintoni** *Sandwith*, sp. nov. ; *C. melanadeniae* (Rose) Standley affinis, foliis multo majoribus, pinnis 9, foliolis in quaque pinna 10–12 dense nitenter pubescentibus fere subsericeis, racemo longo conspicuo multifloro, pedicellis longioribus, fructu majore facile distinguitur.

Frutex elatus, 4 m. altus, inermis, ramulis summis lignosis robustis cortice pruinoso-cinereo obtectis. *Folia* vulgo 9–15 cm. longa, gracilia, glandulis parvis nigrescentibus conspersa ; petiolus glaber, 2·8–5 cm. longus ; rhachis glabra vel sursum sparse pilosula ; pinnae 4-jugae cum summa terminali, molliter pilosulo-pubescentes, 2–3·5 cm. longae, petiolo vulgo 6–9 mm. longo ; foliola 4–6-juga, sese conspicue imbricantia, obovato-oblonga vel oblonga, apice rotundata, 6–12 mm. longa, 3–6·5 mm. lata, marginibus utrinque glandulis nigris crebris conspicue maculata, utrinque pilis cinereis nitentibus dense molliter pubescentia, juniora fere subsericea, costa supra canaliculato-impressa subtus prominente, nervis ceteris vix cernendis. *Inflorescentia* racemosa vel basi paniculata, conspicua, 15–20 cm. longa (forsan longior), racemis ut videtur circiter 30–40-floris, ubique pilis cinereis patentibus pubescens atque glandulis brevistipitatis satis copiose praedita ; pedicelli graciles, saepius subhorizontaliter patentes, apice in alabastrum saepe sursum arcuati, evoluti 0·8–1·4 cm. longi, apicem versus articulati. *Alabastra* siccitate rubro-purpurea. *Calycis* tubus late turbinatus, circiter 2 mm. longus, apice 5 mm. latus ; sepala oblonga vel ovata, obtusa, 7 mm. longa, 3·8–5 mm. lata, extra dense pubescentia et praesertim marginibus stipitato-glandulosa. *Petala* ungue pubescente 1–1·5 mm. longo, lamina glabra ovata vel ovato-elliptica obtusa 7 mm. longa 3·8–5 mm. lata. *Stamina* arcuata ; filamenta circiter 8·5 mm. longa, igitur petala subaequantia, dimidio inferiore crassa carnosa uno latere dense pubescentia, superiore attenuata glabra sed glandulis magnis flavis poculiformibus stipitatis praedita ;

antherae circiter 1·5 mm. longae. *Ovarium* circiter 2 mm. longum, marginibus villoso-pubescens, paginis glandulis flavis sessilibus praeditum ; stylus superne saltem glaber, 3–4 mm. longus. *Fructus* falcatus, 4–6 cm. longus, 1·2–1·5 cm. latus, ei *C. melanadeniae* similis, siccitate pallide brunneus, et dense pubescens et glandulis obscure brunneis crebris sessilibus vel subimmersis maculatus ; pedicelli fructiferi vulgo 1·5 cm. longi.

State of Guerrero. District of Coyuca ; Cuajilote, by trail, fl. and fr. Jan. 29th, 1934, *Hinton* 5567 ; leaves and fr. from same tree, May 9th, 1935, *Hinton* 7746 (typus). " Shrub, 4 m. high."

Vernacular name : *Trompetilla*.

Inga (Series **Pilosiusculae**) **Hintoni** *Sandwith*, sp. nov. ; *I. Pringlei* Harms (? *I. Schiedeanae* Steud.) affinis, foliolis vulgo haud acuminatis, bracteis parvis quam alabastris multo brevioribus, calyce necnon dentibus suis brevioribus, corolla breviore differt.

Arbor parva, ramulis annotinis cinereis crebre lenticellatis, hornotinis dense ferrugineo- vel fulvo-pilosulis. *Folia* pro rata parva, inferiora ad 20 cm. longa, superiora 8–15 cm. longa, petiolo costa rhacheos petiolulis colore ramulorum dense pilosulis ; petiolus nudus, 0·7–2 cm. longus ; internodia rhacheos 1–2·5 cm. longa, alis conspicuis glabrescentibus vel ciliato-pilosulis ; glandulae parvae sessiles vel stipitatae, ore parvo vel etiam obsoleto, saepe flavescentes ; petioluli brevissimi, ad 1·5 mm. longi ; foliola 4–5-juga vel summa saepius 2–3-juga, oblongo-lanceolata vel elliptico-lanceolata vel elliptica, ima nonnunquam oblongo-ovata, apice obtusa apiculata vel acuta, raro acuminata, basi rotundata et saepius levissime cordata, ima 2–4·5 cm. longa, ad 2·1 cm. lata, summa 4–12·5 cm. longa, 1·5–4·4 cm. lata, coriacea, supra nitidula, juventute praesertim costa nervis marginibusque pilosula, saepe demum glabra, nervis primariis lateralibus utroque costae latere 10–15 supra vix prominulis vel planis subtus prominentibus, rete venularum supra prominulo vel impresso subtus prominulo, areolis subtus manifestis. *Inflorescentiae* ex axillis exorientes 1–3 ; pedunculi nudi 1·5–3 cm. longi, dense ferrugineo- vel fulvo-pilosuli. *Spicae* densae, oblongo-ovoideae, 1·5–3 cm. longae, floribus sessilibus ; bracteae spathulato-lineares, extra pilosulae, 2·2–2·5 mm. longae, basibus conico-gibbosis exceptis caducae. *Alabastra* pyriformia, ferruginea vel fulva. *Calyx* subtubularis, basi contractus atque substipitatus, totus 4·5–5 mm. longus, extra tubo sparse dentibus densius subadpresse pilosulus, unilateraliter fissus ; dentes triangulares acuti, circiter 0·75 mm. longi. *Corolla* tota 7 mm. longa, inferne cylindrica glabrescensque, sursum aliquantum ampliato-campanulata ac extra adpresse ferrugineo-pubescens ; lobi ovato-deltoidei vel fere lanceolati, 2·3–2·5 mm. longi, 1·3–1·5 mm. lati. *Tubus staminalis* inclusus. *Ovarium* glabrum ; stylus glaber, circiter 1·1 cm. longus, stamina paullulo superans. *Fructus* lineari-oblongus, apice truncatus, basi rotundatus vel truncatus, valde applanatus, marginibus crassis

elevatis, 3·7–13·7 cm. longus, 1·4–2 cm. latus, marginibus ad 5 mm. altis, dense fulvo- vel ferrugineo-pilosus.

State of Mexico. District of Temascaltepec: Nanchititla, in barranca, fl. April 1935, *Hinton* 7617 (typus), fl. March 1935, *Hinton* 7667, fr. June 1934, *Hinton* 6171, fr. July 1935, *Hinton* 8103, fr. August 1935, *Hinton* 8232; Temascaltepec, 1750 m., by the river, fr. June 1933, *Hinton* 4182, fl. March 1936, *Hinton* 8978; Rincón, fl. March 1932, *Hinton* 456. Described as a tree 10–12 m. high.

Vernacular name: *Jacaniquil*, but this name is applied to other species of *Inga* in the same district.

Rubiaceae (A. A. Bullock).

Bouvardia multiflora (*Cav.*) *Schultes* in Roem. et Schultes, Syst. Veg. Mant. **3,** 118 (1827); Standl. in N. Amer. Fl. **32,** 107 (1921), et in Contrib. U.S. Nat. Herb. **23,** 1363 (1926), partim, non Standl. in Publ. Field Mus. Chicago, Bot. Ser. **11,** 187 (1936). *Aeginetia multiflora* Cav. in Anal. Cienc. Nat. **3,** 131 (1801). *Bouvardia versicolor* Ker in Bot. Reg. **3,** t. 245 (1817); Standl. in N. Amer. Fl. **32,** 105 (1921), et in Contrib. U.S. Nat. Herb. **23,** 1363 (1926). *B. Cavanillesii* DC. in DC. Prodr. **4,** 366 (1830); Benth. Pl. Hartw. 63 (1839). *B. bicolor* Kunze in Linnaea, **20,** 24 (1847). *B. macrantha* Standl. in N. Amer. Fl. **32,** 107 (1921) et in Contrib. U.S. Nat. Herb. **23,** 1363 (1926).

State of Jalisco. Rocky bluffs of barrancas, San Marcos, June 1893, *Pringle* 4387; Tuquila (Tequila?), 1839, *Hartweg* 471.

State of Oaxaca. *Ghiesbreght* 3.

State of Hidalgo. Zimapan, *Coulter* 219.

State of Michoacan. Hills bordering Lake Cuitzco, Aug. 1892, *Pringle* 4138.

State not Determined. Chinantla, May 1841, *Liebmann* 32; Alpatlahua, July and Sept. 1841, *Liebmann* 73, 74; Consoquitla, Nov. 1841, *Liebmann* 75; Cumbre de Estepa, June 1842, *Liebmann* 33.

The above concept of *B. multiflora* is somewhat different from Standley's, published in the North American Flora and repeated in his "Trees and Shrubs of Mexico," and is based upon a careful study of the original descriptions, in conjunction with the specimens in the Kew herbarium, many of which have been determined by Standley himself. The flower colour, and length of corolla tube, used in his keys to distinguish *B. versicolor* and *B. macrantha*, have been found to be valueless. There are two sheets of the Pringle specimen (No. 4138) cited above at Kew, one of which has been determined by Standley as *B. macrantha*, the other as *B. multiflora*. If not from the same plant, the two specimens are certainly conspecific.

The reduction of *B. versicolor* and *B. bicolor*, both of which were founded on cultivated plants, seems to be the only possible course to adopt, in view of the general agreement between the original descriptions, and also of the fact that although *B. multiflora* is a

fairly common shrub, neither *B. versicolor* nor *B. bicolor* has ever been truly identified with wild material. Standley gives "Guanajuato and Michoacan to Oaxaca" as the distribution of *B. versicolor* (to which he reduced *B. bicolor*), but this is also part of the range of *B. multiflora*. Of the specimens at Kew, as A. Gray (in Proc. Amer. Acad. 22, 416: 1887) remarked, "The only specimen in the Kew Herbarium which answers to *B. versicolor* . . . is one cultivated in the Montpellier garden in 1831."

Bouvardia triflora *H. B. K.* Nov. Gen. et Sp. **3,** 386 (1820). *Anotis longiflora* Benth. Pl. Hartw. 23 (1839). *Houstonia triflora* (H. B. K.) A. Gray in Proc. Amer. Acad. **4,** 314 (1860). *Bouvardia versicolor* var. *graciliflora* A. Gray, *l.c.* 416. *B. multiflora* Standl. in N. Amer. Fl. **32,** 107 (1921), et in Contrib. U.S. Nat. Herb. **23,** 1363 (1926) pro min. part.

State of Durango. At or near Durango, April–Nov. 1896, *Palmer* 304.

State of Zacatecas. Zacatecas, *Hartweg* s.n. (in herb. Hook.).

State of Aguascalientes. Aguascalientes, 1839, *Hartweg* 206 (in herb. Benth.).

State of Jalisco. Rio Blanco, June–Oct. 1886, *Palmer* 154. Chapala, Oct.–Nov. 1886, *Palmer* 708. Shaded ledges, Tequila, July 1893, *Pringle* 4437. Barranca of Guadalajara, 1350 m., July 1902, *Pringle* 9820.

State of Oaxaca. Mistera alta, 2100 m., Aug., 1840, *Galeotti* 1224. Near Oaxaca, June, *Andrieux* 333.

State of Michoacan. Hills bordering Lake Cuitzco, Aug. 1892, *Pringle* 4137. Campo Morado, June 1899, *Langlassé* 1056 (Guerrero ?)

Bouvardia gracilis A. Gray, which Standley wrongly reduced to *B. multiflora*, is evidently very near to *B. triflora*. It is recorded only from Chihuahua, and the single specimen at Kew, bearing only one or two capsules, is insufficient for a decision as to its status to be made. It is rather different in facies from *B. triflora*.

B. triflora differs most markedly from *B. multiflora* in its very slender, and usually shorter, corolla. Herbarium specimens can be readily distinguished by this means, and although other technical distinguishing characters are difficult to find, the two plants present different facies, and the writer prefers to maintain them as distinct species. Careful consideration of the descriptions in the North American Flora leads to the conclusion that this plant is, in the main, Standley's *B. multiflora*, whilst specimens here referred to *B. multiflora* (Cav.) Schultes constitute his *B. macrantha*; no definite conclusion can be reached, however, as herbarium specimens unfortunately are not cited in the North American Flora.

Bouvardia xylosteoides *Hook. et Arn.* Bot. Beechey Voy. 428 (1840); Standl. in N. Amer. Fl. **32,** 111 (1921), et in Contrib. U.S. Nat. Herb. **23,** 1365 (1926), sub spp. dub. *B. villosa* Standl. in N.

Photograph of the type specimen of *Bouvardia xylosteoides* Hook. et Arn., with the Herb. J. Gay specimen attached, to illustrate the label confusion described in the text (p. 307).

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Amer. Fl. **32,** 107 (1921), et in Contrib. U.S. Nat. Herb. **23,** 1363 (1926), et in Publ. Field Mus. Chicago, Bot. Ser. **11,** 187 (1936). [Pl. X].

State of Oaxaca. Lower mountains near Mitla, July, *Andrieux* 335 (type of *B. xylosteoides*, in Kew Herb., cited in error by Hooker and Arnott as No. 333); Alturas de Matatlán, 1800 m., June 1906 *Conzatti* 1486 (type of *B. villosa*, in U.S. Nat. Herb., photograph in Kew herb.).

The label on the type specimen in Hooker's herbarium was twice altered by Andrieux before Hooker received it. It was first numbered "333" then changed to "335" and finally the "5" was partially obliterated and "3" written above it. That 335 is the correct number is shown by the similar specimen from Herb. J. Gay, mounted subsequently on the same sheet as Hooker's specimen, and clearly (twice) numbered "335." Andrieux' number 333 is also represented at Kew, and it was evidently part of this gathering which Standley placed under *B. multiflora* when he reduced *B. xylosteoides* to that species. In the writer's opinion, however, the Kew example of No. 333 should be referred to *B. triflora*, specimens of which are enumerated above.

The erroneous numbering of Andrieux' No. 335 accounts for Standley's reduction of *B. xylosteoides* and maintenance of his own *B. villosa*, and serves to illustrate the danger of accepting a "type number" as the equivalent of an actual type, without reference to the original description.

Bouvardia Hintoni *Bullock*, sp. nov.; affinis *B. capitatae* Bullock,* sed foliis multo longius petiolatis basi valde acutis, subtus levissime pubescentibus marginibus parcissime ciliatis, calycis lobis minoribus glabris, corollae tubo breviore extra minutissime papilloso-puberulo differt.

Frutex ramosus, 2 m. altus, fere glaber; rami graciles, teretes, cortice laevi; ramuli hornotini glabri, foliosi, basi cataphyllis instructi, apice floriferi; internodia superioria usque ad 6 cm. longa. *Folia* opposita, ovata vel elliptica, usque ad 9 cm. longa et 4 cm. lata, apice acuta vel saepius acute acuminata, basi acuta vel cuneata, saepe plus minusve inaequilateralia, supra fere glabra, subtus in costa et nervis lateralibus prominulis utrinsecus 5-6 valde adscendentibus levissime pubescentia, marginibus leviter sed manifeste ciliata; petioli usque ad 1 cm. longi, supra canaliculati, marginibus ciliati; stipulae subulatae, usque ad 5 mm. longae, cum petiolo vaginato-connatae. *Flores*† apice ramulorum in thyrsos contractos usque ad 12-floros subcapitato-congesti; rami inflorescentiarum breves, raro usque ad 2·5 mm. longi; pedicelli brevissimi; bracteae oppositae, vaginato-connatae, exteriores subfoliaceae, interiores valde redactae. *Calyx* urceolatus; tubus (receptaculo incluso) 2 mm. longus, glaber; limbus 4-dentatus, dentibus triangularibus

* Bullock in Hook. Ic. Pl. t. 3296 (1935).

† Flores longistyli tantum visi.

acutis ciliatis vix 1 mm. usque ad 1·5 mm. longis patentibus. *Corolla* anguste tubulosa, extra papilloso-puberula ; tubus usque ad 2 cm. longus, intus basin versus villosus ; lobi 4, late patentes, oblongo-elliptici, 4 mm. longi, 2·5 mm. lati, apice subacuti. *Stamina* infra faucem inserta, filamentis filiformibus 1·5 mm. longis, antheris inclusis lineari-oblongis 1·5 mm. longis basin versus dorsifixis basi bifidis. *Stylus* filiformis 2·5 cm. longus ; rami stigmatici 2, lineares, 1 mm. longi, valde papillosi, longe exserti. *Ovarium* turbinatum, 1 mm. longum, nigrum, biloculare ; ovula in singulis loculis numerosa. *Capsula* non visa.

STATE OF MEXICO. District of Temascaltepec, Nanchititla, in a barranca, July, 1935, *Hinton* 8107.

Bouvardia cordifolia *DC.* in DC. Prodr. **4,** 366 (1830) ; Alph. DC. Calq. Dess. Fl. Mex. t. 487 (1875) ; Standl. in N. Amer. Fl. **32,** 111 (1921), et in Contrib. U.S. Nat. Herb. **23,** 1365 (1926), sub. spp. dub. ; Bullock in Hook. Ic. Pl. t. 3323 (1936).

STATE OF MEXICO. District of Temascaltepec : Pantoja, on a dry hill, June 1933, *Hinton* 4078, " Shrub 1 m. high, flowers red " ; Nanchititla, in oak woods, June 1935, *Hinton* 7893, " Flowers orange " ; Temascaltepec, in oak woods, July 1935, *Hinton* 7950, " Shrub 1 m. high, flowers orange."

STATE OF MICHOACAN. Near Morelia : Santa Maria, 1950 m., June 1909, *Arsène* 2753 ; *syn. not.*, 1910, *Arsène* 6627 ; Punguato, 2100 m., July 1909, *Arsène* 3046 (in Herb. Mus. Brit.).

WITHOUT LOCALITY : *Sessé and Mociño* (syntype in Brit. Mus.).

The agreement between the specimens cited and the original description and plate leaves no room for doubt that the above identification is correct. The syntype specimen at the British Museum is labelled " Herb. Pavon.", as are a large number of Sessé and Mociño's plants. This is a further illustration of the great value of Mr. Hinton's intensive collection in this Sessé and Mociño area. The *Arsène* specimens cited have been named " *Bouvardia multiflora,* var." by Standley.

Bouvardia Houtteana *Schlecht.* in Fl. des Serres, Sér. 1, **10,** 149, t. 1024 (1854–5).

I have been unable to identify this plant with any specimens in the Kew Herbarium ; the original description and plate are good, and are based on cultivated plants grown by Van Houtte from seed collected in " Central America." The most important specific characters are " corollae coccineae extus minutissime puberulae . . . basi intus villoso," and it is evidently near *B. cordifolia* DC. as delimited above. It differs, however, in its laxer, multiflorous inflorescence, widely spreading corolla-lobes, " glabrous " branchlets and leaves (" foliis . . . glabris . . . supra saturate viridibus asperiusculis subtus pallidis "), the latter being ovate-lanceolate and acute at the base.

Deppea Hintoni *Bullock*, sp. nov.; *D. erythrorhizae* Cham. et Schlecht. affinis sed foliis tenuioribus longius petiolatis saepe in quoque pari inaequalibus, calycis lobis majoribus acute triangularibus, corollae lobis majoribus pro rata latioribus apice rotundatis, filamentis staminum longioribus satis differt ; a *D. pubescente* Hemsl. foliis tenuioribus minus pubescentibus longius petiolatis, floribus minoribus recedit.

Frutex ramosus, circiter 1 m. altus, parce pubescens ; rami ramulique graciles, ligno rubro-tincto, hornotini pilis crispatis rubris parce induti, annotini glabrati, cortice pallide brunneo laevi, internodiis 1–3 cm. longis. *Folia* tenuia plerumque opposita, rarius ternata, in quoque pari saepe inaequalia, ovato-elliptica, apice acuta, basi plerumque acutissima vel cuneata, rarius abrupte acuta, saepe inaequilateralia ; lamina usque ad 7 cm. longa et 3·5 cm. lata, sed saepe minor, supra fere glabra, subtus costa et nervis lateralibus (utrinsecus 3–5) parce crispato-pubescens ; petioli graciles, usque ad 3 cm. longi, crispato-pubescentes. *Cymae* laterales et terminales, circiter 12-20-florae, laxae, pedunculis gracilibus 1·5–2.5 cm. longis fere glabris, pedicellis gracilibus ebracteolatis 2–7 mm. longis, bracteis minutis deciduis. *Calyx* (ovario incluso) campanulatus vel turbinatus, 2 mm. longus, 1 mm. diametro, extra levissime pilosulus vel fere glaber, limbo 4–dentato, dentibus triangularibus acutis usque ad 3·75 mm. longis saepe plus minusve inaequalibus. *Corolla* ut videtur aurantiaco-rubra, rotata, tubo vix 1 mm. longo, circiter 7 mm. diametro, extra intusque glabra ; lobi 4, late elliptici, vix 3 mm. longi, 2mm. lati, apice late rotundati, nervis parallelis 5 instructi. *Stamina* 4, corollae basi inserta, filamentis linearibus rubris 1·5 mm. longis, antheris oblongo-ellipticis apice obtusis basi bifidis basin versus dorsifixis 2 mm. longis 0·75 mm. latis. *Discus* annularis, carnosus. *Stylus* linearis, 3.5 mm. longus, apice stigmatosus, clavellato-ampliatus. *Capsula* non visa.

State of Mexico. District of Temascaltepec : Tejupilco, in a barranca, 1340 m., 27 Sept., 1933, *Hinton* 4824.

Closely allied to *D. erythrorhiza* Cham. et Schlecht., the type of the generic name, *D. Hintoni* differs in its somewhat larger flowers, with relatively broader and more rounded lobes, and in the very thin leaves, with longer and more slender petioles and relatively broader lamina. The peduncles and pedicels also are usually shorter in *D. Hintoni* and not quite so slender, and the plant presents a very different facies.

D. Hintoni is closely related also to *D. pubescens*, from which it differs in its thin, less pubescent leaves, longer and more slender petioles, and smaller flowers.

The wood of *D. Hintoni* is reddish in colour, and the same colour is present in the dried flowers ; if this colouring matter, as seems probable, is present in life, *D. Hintoni* is thereby distinguishable from all other known species, where the flower-colour is white to yellow, with the possible exception of *D. pubescens* in which the

flower-colour is unknown, though the red colouring matter is present in the wood.

I have not seen the type of *D. erythrorhiza*, collected by Schiede and Deppe in Vera Cruz, but have accepted as conspecific the Schiede specimen from the Barranca de Tiosela, cited by Schlechtendal in Linnaea, **9**, 599 (1835).

XXVII—RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XVIII.*

E. M. Marsden-Jones and W. B. Turrill.

Selfings of Two Plants of S. vulgaris from Bulgaria and the Results of Crossing One with English S. maritima.

Seeds of many plants of *Silene vulgaris* collected in the Balkan Peninsula have been grown at Potterne and Kew. The two *S. vulgaris* plants dealt with here were selected from stocks raised from seed collected in the western and southern mountains of Bulgaria. They were tall broad-leaved plants. The cross with British *S. maritima* was made partly with the object of discovering if sterility resulted from a cross geographically and morphologically wider than any we had then made between these two species.

The stock plants B.35 and B.36 and the families of wild origin from which they were chosen suffered very badly from *Marssonina* both at Kew and Potterne. The selfed offspring of B.35 and B.36 were also highly susceptible and many plants were completely killed in the course of their second year. We have found in general that most of the inland *S. vulgaris* from south-eastern Europe is, when grown in this country, very susceptible to this fungus disease. Hybrids between British *S. maritima* and Balkan *S. vulgaris* are decidedly resistant.

The following selfings and crosses were made.

N.23 = B.35 selfed.
N.56 = B.36 selfed
N.99 = N.56 plant 27 selfed
N.25 = A.6 × B.36
N.89 = N.25 plant 1 selfed
N.90 = N.25 plant 3 selfed
N.98 = N.25 plant 2 selfed

B.35. Seed collected on the Karlik Dagh, Greek-Bulgarian frontier, southern Rodopes, 19.7.26, on dry open slopes in *Abies* zone.

Habit : stems erect, up to 6·0 dm. high, with merest trace of anthocyanin in vegetative parts, glabrous.

Leaves : lanceolate to oblong, 6 cm. long, 2·2 cm broad, glabrous, yellow-green in colour.

Inflorescence : with up to 100 flowers, more or less drooping, zygomorphic ; bracts all at first green-herbaceous, many becoming scarious later, without cilia, rather elongated ; plant hermaphrodite.

*Continued from K.B. 1937, 53.

Dried specimen of *S. vulgaris*, B. 35, from seed collected on the Graeco-Bulgarian frontier.

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Calyx : inflated, with merest trace of anthocyanin.

Corolla : with petals divided ⅓ length of lamina, petals and segments not contiguous or overlapping, petals 1·4 cm. long, 0·4 cm. broad, with well developed bosses, no blotch ; corolla 1·6 cm. diam.

Filaments : purple ; anthers purple.

Immature seeds : white. *Stigmata* purple.

Ripe capsules : of *vulgaris* type with erect teeth, I-II in shape, 6 mm. long 6 mm. diam. ; teeth 1·5 mm. long ; mouth 2 mm. diam.

Carpophores : 3 mm. long, 2 mm. diam.

Mature seeds : tubercled.

N.23. = B.35 selfed. 21 plants in the family.

Vegetative characters and calyces uniformly as in the parent, stems up to 6·0 dm. high.

Inflorescence : with 16 to 36 flowers.

Petals : and segments not contiguous or overlapping ; petals divided ⅓ length of lamina ; 20 with bosses, 1 small scale ; no blotch.

Inflorescence : 6 with hermaphrodite flowers only ; 1 with hermaphrodite and female flowers ; 14 with female flowers only ; filaments 5 purple ; 1 white ; anthers 6 purple.

Gynoecium : stigmata 8 purple, 13 white ; immature seeds all white.

Mature capsules : all scorable (6) were of typical *vulgaris* shape, with erect teeth.

Mature seeds : all scorable (4) were tubercled.

All the plants in this family suffered very badly from *Martonima*.

B.36. Seed collected above the Rila Monastery, Rodopes, Bulgaria, 1.8.26, dry open slope in *Fagus silvatica* zone.

Habit : stems erect or slightly ascending up to 7·2 dm. high, with a medium amount of anthocyanin, medium short pubescence ; plant hermaphrodite.

Leaves : lanceolate to oblong, 7 cm. long, 2·5 cm. broad, shortly pubescent on both surfaces.

Inflorescence : with up to 50 flowers, more or less drooping, zygomorphic, bracts all at first green-herbaceous, many becoming scarious later, without cilia, rather elongated.

Calyx : inflated, with medium anthocyanin.

Corolla : 1·5 cm. diam. ; with petals divided ⅓ length of lamina, petals and segments not contiguous or overlapping, petals 1·6 cm. long, 6·5 mm. broad, with well developed bosses white above, yellowish green below, with anthocyanin blotch.

Filaments : purple ; anthers purple.

Immature seeds : white. *Stigmata* purple.

Ripe capsules : of the *vulgaris* type with erect teeth, I-II in shape: 6 mm. long, 6 mm. diam. ; teeth 1·5 mm. long ; mouth 2 mm. diam.

Carpophores : 3 mm. long, 2 mm. diam.

Mature seeds : armadillo, but the "plates" not well defined.

N.56 = B.36 selfed. 49 plants in the family.

Habit and vegetative parts : as parent ; stems up to 6·2 dm. high.

Indumentum : 36 medium : 6 few : 7 glabrous.

Inflorescence : with up to 50 flowers, zygomorphic ; bracts as in parent.

Calyx : inflated ; 1 with much anthocyanin : 44 with medium : 4 with little.

Corolla : petals white above yellowish green below, all petals divided $\frac{3}{4}$ length of lamina, petals and segments not contiguous or overlapping, all with bosses, 47 with blotch : 2 with no blotch, colour as parent.

Androecium : 36 with hermaphrodite flowers only : 6 with hermaphrodite and female flowers : 7 with female flowers only : filaments all purple ; anthers all purple.

Gynoecium : stigmata all purple, except one white ; immature seeds all white.

Ripe capsules : all scorable were of *vulgaris* type, with erect teeth (10 unscorable).

Mature seeds : all scorable were armadillo (11 unscorable).

N.99 = N.56 plant 27 selfed. 78 plants in the family.

N.56 plant 27 was glabrous and had hermaphrodite and female flowers, a petal blotch, and purple stigmata.

The plants were all uniform for the following characters : habit and foliage as parent ; anthocyanin in vegetative parts medium ; glabrous ; flowers all zygomorphic ; calyx inflated ; petals white above yellowish-green below, $\frac{3}{4}$ lobing, with bosses, petals and segments not contiguous or overlapping ; filaments and anthers purple ; immature seeds white. Stems up to 6·3 dm. high. Inflorescence with up to 120 flowers.

Anthocyanin in calyx : 59 medium : 17 little.

Petals : 13 multilobed : 52 bilobed ; 45 anthocyanin blotch : 20 no anthocyanin blotch.

Sex : 4 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 54 with female flowers only.

Stigmata 54 purple : 10 white ; immature seeds all white.

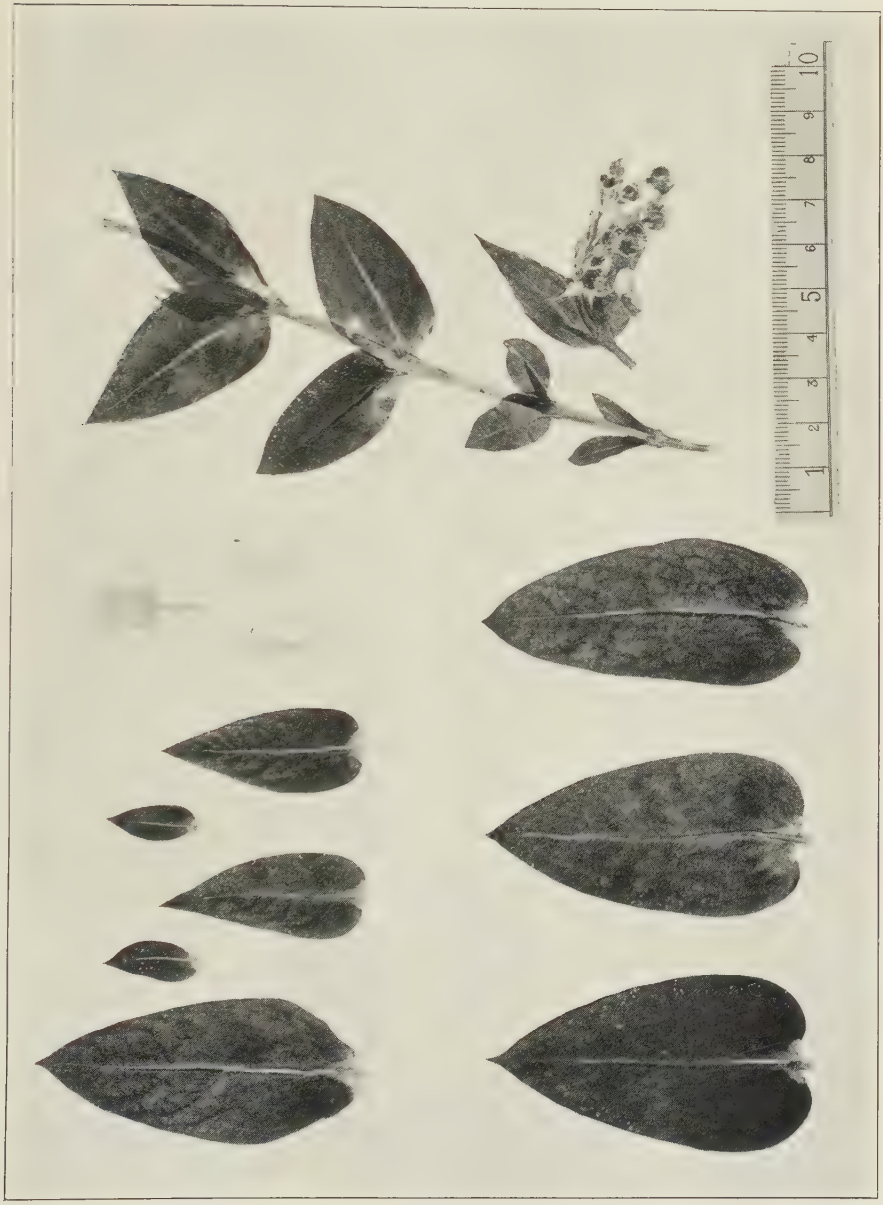
Ripe capsules : all scorable were of *vulgaris* type, with erect teeth (22 unscorable).

Mature seeds : all scorable were armadillo (30 unscorable).

Many of the plants in this family produced poor fruits and little or no seed, mainly owing to bad *Marssonina* attack.

N.25. = A.6 × B.36. 6 plants in the family.

These were uniform for the following characters : habit spreading ; medium anthocyanin in vegetative parts ; intermediate for dying down or overwintering of barren shoots ; leaves narrow oblanceolate to narrowly elliptic, average of well formed leaves 4·6 cm. long, 0·8 cm. broad ; calyx with medium anthocyanin ; flowers zygomorphic ; petals and segments not contiguous or overlapping, blotch



Material showing leaf and floral characters of the plant in Pl. XI.

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Dried specimen of *S. vulgaris*, B. 36, from seed collected above the Rila Monastery, Bulgaria.

present, bilobed, ¾ lobing, small scales ; filaments, anthers, stigmata and immature seeds coloured. The three plants used to produce the F_2 families had armadillo seeds and *maritima* shaped capsules with the teeth reflexing. Plants of this family set very little seed per fruit on selfing.

Differential characters for the three plants used to produce the F_2 families are :

Plant 1. Stems prostrate, 6·2 dm. long ; plant glabrous ; calyx subinflated.

Plant 2. Stems ascending, 3·8 dm. long ; with medium short indumentum ; calyx narrow.

Plant 3. Stems ascending, 5·5 dm. long ; with medium short indumentum ; calyx subinflated.

N.89 = N.25 Plant 1 selfed. 50 plants in the family.

Habit : 29 spreading : 21 compact ; 8 prostrate : 42 ascending ; stems from 2·0 up to 7·7 dm. long ; 11 much anthocyanin in vegetative parts : 37 medium : 2 little ; all glabrous ; 10 with overwintering shoots as in *S. maritima* : 33 intermediate : 5 with green overwintering shoots absent.

Leaves : 2 M : 2 HM : 4 MH : 17 H : 18 VH : 7 HV : 0 V

Inflorescence : with up to 53 flowers ; all more or less zygomorphic.

Calyx : 21 inflated : 26 subinflated : 3 narrow ; 7 with much anthocyanin : 41 medium : 2 little.

Corolla : petals white ; 46 petals divided ¾ the length of the lamina : 3 divided 2/3 ; 9 plants had " poor petals " : 41 normal petals ; 9 multilobed : 41 bilobed ; 1 scale : 2 small scale : 46 boss ; 39 with anthocyanin blotch : 10 with no blotch ; 17 petals overlapping or contiguous : 32 not overlapping or contiguous ; 27 segments overlapping or contiguous : 22 not overlapping or contiguous.

Androecium : 18 with hermaphrodite flowers only : 2 with hermaphrodite and female flowers : 30 with female flowers only ; 20 filaments purple ; 20 anthers purple.

Gynoecium : stigmata 8 white : 41 purple ; immature seeds 5 white : 45 purple.

Ripe capsules : *maritima* shape 5 : *vulgaris* shape 4 : intermediate 18 : unscorable 23 ; reflexing teeth 7 : erect teeth 4 : spreading 16 : unscorable 23. Erect teeth and *vulgaris* shape were exactly correlated. One *maritima* type had spreading teeth the remainder reflexing. Three intermediate types had reflexing teeth.

Mature seeds : 14 (all scorable) were armadillo.

Many of the plants of this family produced poor fruits and very little or no seed.

N.90 = N.25 Plant 3 selfed. 51 plants in the family.

Habit : 22 spreading : 29 compact ; all ascending ; stems from 2·2 dm. up to 7·7 dm. long ; 5 much anthocyanin in vegetative parts : 46 medium ; 12 indumentum dense : 22 medium : 4 few :

13 glabrous ; overwintering shoots as in *S. maritima* 16 : intermediate 30 : green overwintering shoots absent 4.

Leaves : 0 M : 5 HM : 12 MH : 23 H : 10 VH : 1 HV : 0 V

Inflorescence : with up to 36 flowers ; all more or less zygomorphic except 1 plant actinomorphic.

Calyx : 4 inflated : 46 subinflated ; 3 with much anthocyanin : 47 medium.

Corolla : petals white ; all petals divided $\frac{3}{4}$ the length of the lamina ; 3 plants had " poor petals " : 48 with normal petals ; 1 plant had involute petal segments ; 2 multilobed ; 49 bilobed : 0 scale : 1 small scale ; 48 boss ; 45 with anthocyanin blotch : 4 with no blotch ; 12 petals overlapping or contiguous : 37 petals not overlapping or contiguous ; 16 segments overlapping or contiguous : 33 segments not overlapping or contiguous.

Androecium : 41 with hermaphrodite flowers only : 3 with hermaphrodite and female flowers : 6 with female flowers only ; 44 filaments purple ; 44 anthers purple.

Gynoecium : stigmata 8 white : 41 purple ; immature seeds 3 white : 46 purple.

Ripe capsules : *maritima* shape and reflexed teeth 4 : *vulgaris* shape and erect teeth 8 : intermediate shape and spreading teeth 34 : unscorable 5.

Mature seeds : 46 (all scorable) armadillo.

Many of the plants of this family produced very little seed.

N.98 = N.25 Plant 2 selfed. 26 plants in the family.

Habit : 16 spreading : 10 compact ; 9 prostrate : 17 ascending ; stems from 1·7 up to 6·8 dm. long ; 7 much anthocyanin in vegetative parts : 9 medium : 7 little : 3 none ; 0 indumentum dense : 12 medium : 12 few : 2 glabrous ; overwintering shoots as in *S. maritima* 8 : intermediate 12 : green overwintering shoots absent 4.

Leaves : 0 M : 6 HM : 7 MH : 8 H : 4 VH : 1 HV : 0 V

Inflorescence : with up to 63 flowers ; all more or less zygomorphic.

Calyx : 0 inflated : 18 subinflated : 8 narrow ; 3 with much anthocyanin : 14 medium : 5 little.

Corolla : 19 petals white : 6 white above, yellowish-green below : 1 flushed pink ; all petals divided $\frac{3}{4}$ the length of the lamina ; 6 multilobed : 19 bilobed ; 1 scale : 15 small scale : 10 boss ; 17 with anthocyanin blotch : 9 with no blotch ; 8 petals overlapping or contiguous : 17 petals not overlapping or contiguous ; 6 segments overlapping or contiguous : 19 segments not overlapping or contiguous.

Androecium : all hermaphrodite ; 25 filaments purple : 1 white ; 21 anthers purple : 5 yellow-green.

Gynoecium : stigmata 6 white : 20 purple ; immature seeds 9 white : 17 purple.

Material showing leaf and floral characters of the plant in Pl. XIII.

Ripe capsules : *maritima* shape with reflexed teeth 12 : *vulgaris* shape with erect teeth 0 : intermediate shape with spreading teeth 11 : unscorable 3.

Mature seeds : 23 (all scorable) armadillo.

DISCUSSION.

Stock plant B.35 bred true for all specific diagnostic characters and for many of the intraspecific varietal characters. It segregated for sex, filament colour, and stigma colour. It was impossible to use this plant and its offspring for further experiments owing to their high degree of susceptibility to *Marssonina*.

Stock plant B.36 also bred true for all specific diagnostic characters, and for the intraspecific varietal characters studied except that in the first selfing it segregated for anthocyanin in calyx, for petal blotch, indumentum, sex, and stigmata colour, and a selfed offspring segregated for anthocyanin in calyx, lobing for petals, anthocyanin blotch, sex, and stigmata colour.

B.36 was remarkable for its large broad leaves and it was crossed with a narrow leaved *S. maritima* (A.6), described in Kew Bull. 1929, 147, using this latter as the ovule parent. Three F_1 sibs were selfed and the following discussion is given of the results obtained.

Habit. Spreading dominated over compact in F_2 but the totals for the three F_2 families showed little difference ; ascending dominated over prostrate and very few prostrate plants appeared in the F_1 families. The maternal grand-parent had a rather intermediate (half-prostrate) habit.

Stem length. The totals for the F_2 families show a frequency table giving a close approximation to a normal curve with the mode in the class 41–50 cm. This and the figures generally point to a rather predominating influence of the maternal parent.

Family	11-20	21-20	31-40	41-50	51-60	61-70	71-80	Max-imum	Mini-mum	Mean	S.D of mean
N.89	1	1	7	18	12	8	3	77	20	51	12.3
N.90	0	8	13	21	5	3	1	77	22	43	11.8
N.98	0	5	2	6	10	2	0	68	17	46	13.8
Totals	2	14	22	45	27	13	4	77	17	46	

Table of stem lengths, with a frequency table based on seven classes with 10 cm. as the class range, and maximum, minimum, and mean in cm., and standard deviation of the mean for three F_2 families from three F_1 sibs.

Leaves. The totals for the three F_2 families are : 2 M : 13 HM : 23 MH : 48 H : 32 VH : 9 HV : 0 V. There is no doubt that segregation occurs but it is not clear-cut, the limits between the groups being difficult to define. Plants of hybrid type are most numerous and in 127 F_2 plants only 2 could be assigned to the same

leaf type as the maternal grand-parent, and none to the same leaf type as the paternal grand-parent, i.e. while the extreme narrow leaf type of the Portland variety of *S. maritima* reappeared twice (in the same F_2 family, N.89), the extreme broad leaf type of the Bulgarian *S. vulgaris* did not reappear at all. At least three factors, possibly of a cumulative nature, must be involved, perhaps more.

Inflorescence. Flower counts for all plants were not made. The maximum values given are segregates of a *vulgaris* character. Only one plant (out of 127) had completely actimorphic flowers, all the others had flowers more or less zygomorphic.

Indumentum. This was of a rather short type. The parent B.36 on selfing segregated for indumentum and a glabrous plant of the selfed family bred true to the glabrous character on selfing. The F_1 family also segregated for indumentum. The F_2 family from a glabrous F_1 was glabrous. The F_2 families from plants with medium indumentum segregated, the larger giving the four types—dense, medium, few, and glabrous.

Calyx. The F_1 family showed segregation for calyx shape, and while all three F_2 families showed a maximum of " subinflated ", " inflated " types appeared only in the two F_2 families with a " subinflated " F_1 parent and the F_2 family with a " narrow " F_1 parent produced a ratio of 9 subinflated : 4 narrow.

Corolla. Three plants (in one family) had petals divided only 2/3, and 12 plants, distributed in two families, produced " poor petals " as against 81 with normal petals in the same two families. One plant also appeared with involute petal lobes. 17 plants had some multilobed petals and 109 only bilobed petals (at the times of scoring). The F_1 was uniform for small scale (a typical interspecific F_1 condition) but only 2 full scales appeared (in two families) in F_2 and only in one family (N.98) did small scale plants exceed in numbers those with bosses. Not overlapping of petals and of segments is dominant to overlapping (or contiguity) in F_1 and segregation occurs in all F_2 families with dominance in ratios from 2 : 1 to 3 : 1, except in one family for segments where the ratio is inexplicably 11 : 13·5.

Sex. One family gave a large proportion of female plants, the other two predominantly or entirely hermaphrodites. The immediate parent of the former was probably heterozygous for sex though entirely hermaphrodite at the time of scoring.

Mature capsules. The ratios for the three F_2 families total 25 *maritima* : 63 intermediate : 8 *vulgaris*. The poor development and small size of many of the capsules, however, made scoring very difficult. The dominance of *maritima* capsules in the (very small) F_1 family was unexpected. The correlation between *maritima* shaped capsules and reflexing teeth, *vulgaris* shaped capsules and erect teeth, and intermediate capsules and spreading teeth is very high and sometimes unity. There is, however, occasionally a breakdown of the correlation in the F_2 families, and such a breakdown is occasionally found in the wild (see Kew Bull. 1931, 132-133). There appears to

Material of N. 25. Plant 2 (A. 6 × B. 36).

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be here either a close linkage with a low-percentage of breaks or interference by other genes of the normal phenotypic expression which characterizes one gene.

Mature seeds. All families bred true for armadillo seeds.

Anthocyanin development.

Vegetative parts :

	much	medium	little	none
N.89	11	37	2	0
N.90	5	46	0	0
N.98	7	9	7	3

Calyx:

	much	medium	little	none
N.89	7	41	2	0
N.90	3	47	0	0
N.98	3	14	5	4

Anthocyanin blotch;

N.89	39 present	10 absent
N.90	48 ,,	4 ,,
N.98	17 ,,	9 ,,

Filaments :

All purple except in N.98 with the ratio 25 purple : 1 white

Anthers :

All purple except in N.98 with the ratio 21 purple : 5 yellow-green.

Stigmata :

N.89	41 purple	: 8 white
N.90	41 ,,	: 8 ,,
N.98	20 ,,	: 6 ,,

Immature seeds :

N.89	45 purple	: 5 white
N.90	46 ,,	: 3 ,,
N.98	19 ,,	: 9 ,,

An interesting uniformity in the above figures is the higher proportion of plants showing absence of anthocyanin in any one organ in N.98 than in the other two families. We have frequently noticed a high correlation for anthocyanin development in different organs, which however may not hold for any individual plant. There seems to be some group of general controlling factors which can, however, have their action modified by the action of other factors. In the figures for the above F_2 families no action of an inhibitor can be traced (cp. Kew Bull. 1932, 236-238), but three basic gene pairs appear to be necessary, two dominants of which must be present to give colour.

SUMMARY.

In this paper the genetics of two stocks of *Silene vulgaris* from Bulgaria are investigated by selfings and by crossings, one of them with English *S. maritima*. The two Bulgarian plants showed relatively little segregation on selfing.

On crossing *S. maritima* (narrow leaved) from Dorset with the very broad-leaved *S. vulgaris* decided (but partial) sterility was shown in F_1 and in F_2. Considerable segregation occurred in the F_2 families. A predominating influence of the ovule parent was shown for stem length. Only two plants out of 127 had foliage of the *S. maritima* grand-parental type and none foliage of the *S. vulgaris* grand-parental type; 125 showed various intermediate shapes, the figures suggesting that three or more gene pairs were involved. Segregation also occurred for indumentum, calyx-shape, petal characters, sex, and capsule shape. The plants bred true for armadillo seeds even in the interspecific cross and its offspring. The segregation for anthocyanin development in different organs suggested the interaction of three factor pairs, two dominants of which are essential for the production of colour.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XXVIII—IMPERFECTLY KNOWN SPECIES MISPLACED IN THE FLORA OF THE MALAY PENINSULA.

C. F. Symington (Forest Research Institute, Kepong).

While working in the Herbarium at Kew in 1936, I noted several old Malayan collections upon which have been based new species, and sometimes genera, that are remote from the systematic position which the plants clearly should occupy. Such mistakes are easily made in the absence of adequate material for examination or comparison, but once detected they are fairly obvious. I am recording the necessary corrections as it is desirable to take every opportunity of ridding the literature of redundant names.

Xanthophyllum hebecarpum Chodat (Polygalaceae), in Bull. Herb. Boiss. **4,** 263 (1896); Ridl. Fl. Mal. Penins. **1,** 149 (1922) = **Ryparosa Kunstleri** *King* (Flacourtiaceae), in Journ. As. Soc. Bengal, **59,** pt. 2, 127 (1890) (Mat. p. 67); Ridl. l.c. 165.

Chodat's species is based on *Curtis* 1639, the Kew sheet of which consists of a branchlet with two leaves and two fruits. Ridley remarks: "I have great doubt that this is a *Xanthophyllum* at all."

Duvaliella problematica Heim (Dipterocarpaceae), in Bull. Soc. Linn. Paris, 1009 (1892) = **Dipterocarpus fagineus** *Vesque* (Dipterocarpaceae), in Compt. Rend. **78,** 625 (1874) and Journ. Bot. **12,** 149 (1874); Ridl. Fl. Mal. Penins. **1,** 216 (1922).

The specimen upon which Heim founded the genus *Duvaliella* and the species *D. problematica* consists of sterile galled twigs

collected by Curtis (no. 439) from the hills on Penang Island. The genus has remained "entirely problematical," and, although mentioned by Gilg (in Engl. Pflanzenfam. ed. 2, **21,** 258 : 1925), seems to have been overlooked by most authors subsequent to Heim. There is no doubt that this is simply a sterile galled specimen of the tree, considered to be *Dipterocarpus fagineus*, which is very common in this locality. Van Slooten (in Bull. Jard. Bot. Buitenz. sér. 3, **8,** 318 : 1927) is loth to admit that the Penang tree is conspecific with *D. fagineus* Vesque (described from Borneo), but Brandis, Ridley, Foxworthy and others consider it to be so.

Peniculifera penangensis Ridl. (Sterculiaceae), in Journ. R. As. Soc. Str. Br. **82,** 173 (1920) and Fl. Mal. Penins. **1,** 290 (1922)= **Trigonopleura malayana** *Hook. f.* (Euphorbiaceae), in Hook. f. Fl. Brit. Ind. **5,** 399 (1887) and Hook. Icon. Plant. t. 1753 (1888) ; Ridl. op. cit. **3,** 263 (1924).

The type of Ridley's monotypic genus (*Curtis* 3743) has male flowers and is in every way similar to *Scortechini* 738 upon which Hooker's species and genus are based.

Curtisina penangensis Ridl. (Sapindaceae), in Journ. R. As. Soc. Str. Br. **82,** 180 (1920) and Fl. Mal. Penins. **1,** 490 (1922)=**Dacryodes longifolia** (*King*) *H. J. Lam* var. β. **penangensis** (*Ridl.*) *H. J. Lam* (Burseraceae), in Bull. Jard. Bot. Buitenz. sér. 3, **12,** 342 (1932).

When describing his species and monotypic genus, Ridley mentioned that the specimen (*Curtis* 3648) resembled *Dacryodes* but placed it doubtfully in the *Sapindaceae*. He appears to have mistaken galled ovarial rudiments in male flowers for fruits. This transfer to *Burseraceae* was made by Dr. Lam in 1932.

Napeodendron altissimum Ridl. (Sapindaceae), in Journ. R. As. Soc. Str. Br. **82,** 179 (1920) and Fl. Mal. Penins. **1,** 505 (1922)= **Walsura neurodes** *Hiern* (Meliaceae), in Hook. f. Fl. Brit. Ind. **1,** 564 (1875) ; Ridl. Fl. Mal. Penins. l.c. 412.

The specimen upon which Ridley's species and the genus *Napeodendron* were founded consists of immature flowers. A mature flowering specimen (C.F. 12665) from the same locality put the identity with *Walsura neurodes* beyond doubt.

Alseodaphne crassipes Hook. f. (Lauraceae), in Hook. f. Fl. Brit. Ind. **5,** 146 (1886) ; Ridl. Fl. Mal. Penins. **3,** 100 (1924)=**Helicia excelsa** (*Roxb.*) *Bl.* (Proteaceae), in Ann. Sci. Nat. sér. 2, **1,** 219 (1834) ; Ridl. l.c. 143.

Hooker described *A. crassipes* from a Malacca collection by Maingay (no. 1261) which has abnormally swollen panicle ends and pedicels. Ridley considered it "altogether doubtful, perhaps a *Beilschmiedia*."

Ostodes appendiculata Hook. f. (Euphorbiaceae), in Hook. f. Fl. Brit. Ind. **5,** 401 (1887) ; Ridl. Fl. Mal. Penins. **3,** 270 (1924)=

Lepisanthes Kunstleri King (Sapindaceae), in Journ. As. Soc. Bengal, **65,** pt. 2, 427 (1896) (Mat. p. 713); Ridl. op. cit. **1,** 493 (1922) =**Lepisanthes appendiculata** (*Hook. f.*) *Symington*, comb. nov.

Hooker's species was founded on *Kunstler* 4634, the Kew sheet of which bears only part of a large compound leaf and male flowers. Hooker noted that it might "form a distinct genus when female flowers and fruit are known." In describing *L. Kunstleri* King cites this same number (*Kunstler* 4634) and also 7359 which has fruits in addition to male flowers. He apparently was not aware that 4634 had been made the type of *O. appendiculata.*

XXIX—MISCELLANEOUS NOTES.

William Hales.—The death of Mr. W. Hales, A.L.S., V.M.H., on May 11th removed one of the most skilful and most highly respected horticulturists of modern times. He was in his 64th year, and since October 1899 he had been Curator of the Chelsea Physic Garden, a position that brought him into close contact with many of the leading botanists and horticulturists of the day. In his early years he worked in the Botanic Gardens, Edgbaston, under that great gardener the late Mr. W. B. Latham, and it was during that time that he acquired the love of botany and the scientific side of horticulture that had such a marked bearing upon his life's work. At Edgbaston he had as colleagues Mr. S. A. Skan, who became a botanist at Kew, and the late Dr. E. H. Wilson of plant collecting fame, and all three were prompt to recognise the need for hard and continuous study if they were to rise to the top of their profession. Entering Kew as a young gardener in 1894, Hales spent five successful years there before being appointed Curator of the Chelsea Physic Garden. For some years before his appointment, the fortunes of the gardens had been at a low ebb, but their reconditioning had been decided upon and Hales was chosen to carry out the work. He was well fitted for it, for not only was he a capable plantsman, but he had botanical sympathies, which enabled him to appreciate and assist with the botanical research which was to form an important branch of the work of the rejuvenated Physic Garden. His position brought him into contact with many educational centres and throughout his service the happiest relationship existed between him and their staffs. A better man for the position he held cannot be imagined.

Hales took an active part in educational work connected with horticulture. He served on the committee that drew up the scheme for a National Diploma in Horticulture for Gardeners, and for several years he was an examiner for that Diploma. He also acted as an examiner in horticulture for other bodies. His advice was sought in drawing up the scheme for the B.Sc. in Horticulture instituted by the University of London, and for several years he was an examiner for that degree. Later, he acted in a similar capacity for the Horticultural Degree awarded by the University of Reading. Mr. Hales served for many years on the Scientific and

Floral Committees of the Royal Horticultural Society, and was one of the judges at the spring and autumn shows of the same body.

In recognition of his services to botany he was made an Associate of the Linnean Society in 1912. His services to horticulture were recognised by the Royal Horticultural Society in 1930 by the award of the Veitch Memorial Medal, in 1932 by the award of the Associate of Honour, and in 1935 by the bestowal of the Victoria Medal of Honour. In 1926 the Trustees of the Chelsea Physic Garden, as an appreciation of his work, sent him on a four months' tour of the tropics. During the tour he visited Ceylon, various parts of the Malay States, and Java. Throughout his career Hales was very helpful to young gardeners, but he deprecated too much spoon feeding. He believed in their working hard and studying hard, and he was very keen on gardeners supplementing a sound practical training with scientific knowledge. W. DALLIMORE.

The Structure and Composition of Foods.*—Those who have occasion to study the microscopical structure and chemistry of food materials of vegetable origin are familiar with the lack of comprehensive books on this subject written in English. The publication of this volume will, therefore, be very welcome to English speaking people. The name of Winton is already familiar in the authorship of " The Microscopy of Technical Products " (1907), and " The Microscopy of Vegetable Foods " (1916), but the present work is far more comprehensive than either of these. It is being published in several volumes, of which the second has already been noticed in this journal (K.B. 1936, 337).

It is always a difficulty in books of this kind for the author to decide whether it is preferable to arrange the subject matter on a botanical basis, or to treat similar categories of plant products together irrespective of their botanical origin. In this volume the authors have made a compromise. After a general introduction the book is divided into three parts. In the first of these the various starches are dealt with, followed by cereal products, and then starch-containing seeds from six different families. Part 2 is concerned with oil seeds from twenty-four families. Part 3, which is much shorter than the other two, deals with forage crops. The macroscopic appearance and microscopic structure of each product is described in turn, followed by an account of its chemistry. In addition to the botanical names of the plants, the English, French and German equivalents are given, and in some instances the Spanish and Italian as well. In this connexion readers in Great Britain will probably be surprised to find *Chenopodium album* under the name " Lamb's Quarters." A feature worthy of special attention is the 274 original figures (some by each author) illustrating the general

* By A. L. Winton and K. B. Winton. Vol. 1, Cereals, starch, oil seeds, nuts, oils, forage plants. New York, John Wiley & Sons, Inc. London, Chapman & Hall, Ltd. 1932. Pp. xiv+710. Price £2 10*s*.

appearance or microscopical structure of the various products. These are extremely clear and helpful, and those who have attempted to make illustrations of this kind will realise the great amount of time, skill and patience that their preparation must have entailed. The illustrations also afford an excellent example of the superiority of good drawings over photomicrographs for many purposes. It is most refreshing to read the following statement in a book coming from the U.S.A. where students are so frequently brought up to worship the microtome: "One modern invention, the Gillette razor blade, deserves special mention, as with its keen edge may be cut thoroughly satisfactory sections of practically every kind of material held in the fingers or between pieces of cork." Certain types of section-cutting can, of course, be done only with a microtome, but it is felt very strongly that these instruments should be avoided unless really necessary. The book is well bound, printed and indexed, and can be strongly recommended to all who are in any way concerned with the analysis of foods of vegetable origin.

C. R. METCALFE.

The Soil.*—"Comber" has become so generally accepted as a standard text-book that it is surprising to realise that the first edition was published as recently as 1927. The appearance of a third edition only four years after the second indicates the demand for the book. There is no other published in England to compare with it for a concise and yet reasonably advanced account of soil science.

That is not to say that the book is beyond criticism. The reviewer had the feeling when reading it of a certain lack of balance; the treatment of physics and physical chemistry seemed more detailed and clear than that of other branches, such as soil formation and soil fertility. There have been considerable developments in these subjects in the last few years which might have been more fully described in the new edition. However, this would have required an amount of revision that might appear prohibitive, and short of this the author has shown himself alive to recent developments. He has incorporated a number of new ideas and eliminated some of the old; there are complete new sections on the composition of humus, on water distribution and capillary potential (including Schofield's pF value), and on the use of randomised blocks in field experiments.

Some relatively minor points call for comment. The acidifying action of sulphate of ammonia (p. 113) is primarily to be attributed to the physiological action of the plant rather than to nitrification, since a culture solution will become more acid as a result of the plant taking up ammonium ion directly, and in the soil the sulphate ion

* "An Introduction to the Scientific Study of the Soil." By Norman M. Comber. Third edition. Edward Arnold, London, 1936. Pp. vii + 206. Price 7*s.* 6*d.*

left behind may combine with calcium from the clay complex ; the calcium sulphate is leached away and leaves a hydrogen clay. Among deficiency diseases attributed to minor elements (p. 132) might be included the " heart " diseases of beet, swedes, and even apples, for which boron has been shown to have a remarkable curative action. In discussing the layout of field experiments (p. 168), the phrase " The Chessboard Method or ' Latin Square ' " is perhaps an unhappy one, since the Chessboard arrangements of the past were usually systematic ones, and the essence of the Latin Square, as the author clearly shows, is its random arrangement. The most important attribute of modern field experiment design appears to have been overlooked, namely, that randomising the replicates makes a valid estimate of error possible. In other words, the experimenter finds out not only the results of his treatments, but how accurate or dependable those results are. He may be able to detect small differences ; he is also protected from following false clues.

H. L. RICHARDSON.

Hardy Fruit Growing.*—According to the preface, this book sets out to give commercial growers an introduction to the principles and practice involved in the many phases of hardy fruit growing, and to provide amateurs and professional gardeners with all the necessary information to grow fruit well. The names of the joint authors are a sufficient guarantee that the work is of a high standard.

The book is divided into three sections, the first dealing fully with the preliminary operations of fruit-growing, including soils, selection of sites, preparation of ground, selection of plants, planting technique, etc. The importance of allowing plenty of space between the plants is frequently stressed, yet in some instances the planting distances given are not too generous. The second section deals with upkeep, and in this is included cultivation and manuring, pruning, and the prevention and control of the various insect pests and diseases that afflict the fruit grower. Especially valuable is the chapter dealing with " Fertility and Sterility," since it brings together much useful information that in the past has not been readily accessible to the average fruit grower. This section would have been even more valuable if the process of budding and grafting had been illustrated, for however simple and concise the written word may be, these operations are not easy for the tyro to understand without the aid of diagrams. It is surprising that the authors advocate a tongue graft which, except for the expert, is by no means easy. Further, a simple splice or whip graft serves exactly the same purpose, and has the important advantage of simplicity and speed.

The third section deals with the commercial side of fruit growing. Here of special interest is the short chapter dealing with " What Markets and Public Want."

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* By Sir Frederick Keeble and A. N. Rawes. Macmillan & Co. Ltd., London, 1936. Pp. 334. Illustrated. Price 16*s*.

The book, written in a simple, concise and understandable way, should prove valuable to all hardy-fruit growers.

J. COUTTS.

Botanical Magazine.—The second part of vol. 160 was published on May 8th and contains the following plant portraits :—*Rhododendron niphargum* Balf. f. & Ward (t.9480), a native of Yunnan ; *Paphiopedilum Wardii* Summerhayes (t.9481), discovered by Capt. Kingdon Ward in Northern Burma in 1922 and rediscovered and sent home by him in 1930–31 ; *Penstemon isophyllus* B. L. Robinson (t.9482), from the State of Puebla, Mexico ; *Allium cyaneum* Regel (t.9483), originally found by Przewalski in N.W. Kansu, China ; *Gypsophila Oldhamiana* Miquel (t.9484), a decorative species widely spread in E. Asia ; *Liabum ovatum* (Wedd.) Ball (t.9485), from the Andes of Bolivia and Peru ; *Corydalis verticillaris* DC. (t.9486), from Persia and 'Iraq ; *Homeria collina* (Thunb.) Salisb. (t.9487), a native of the S.W. Cape Province, South Africa ; *Tripterygium Wilfordii* Hook. f. (t.9488), a handsome climber, native of Formosa and S. China to Yunnan ; *Viscaria atropurpurea* Griseb. (t.9489), from Eastern Albania, S. Bulgaria, Serbia, etc., and *Lyonia macrocalyx* (Anth.) Airy Shaw (t.9490), a native of S.E. Tibet and N.W. Yunnan.

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